FEDERAL BUREAU OF INVESTIGATION FREEDOM OF INFORMATION/PRIVACY ACTS SECTION COVER SHEET

SUBJECT: TWA FLIGHT 800

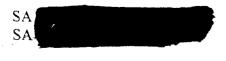
MEDAL EDGE ANALYSIS



265A-NY-259028

TWA Flight 800 Brookhaven National Laboratory Examinations

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December 1, 1997



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FEDERAL BUREAU OF INVESTIGATION

TWA Flight 800, Case 265A-NY-259028

Naval Weapons Industrial Reserve Plant
Calverton, New York

TWA Flight 800 Brookhaven National Laboratory Examinations

Date of Report: December 1, 1997

EXECUTIVE SUMMARY

Brookhaven National Laboratory was asked by the FBI to assist in the Trans World Airlines (TWA) Flight 800 investigation by providing scientific support. Its scientists graciously donated both expert advice and laboratory examinations of several evidence items.

Selected debris items and impact sites on the wreckage of TWA 800 that exhibited possible high energy characteristics were submitted to Brookhaven scientists for microscopic examination and chemical identification. No damage, characteristics, or material compositions were found to indicate the presence of non-TWA Flight 800 or weapons related material.

PROJECT CONTRIBUTORS

FBI:

Squad I-49; research and report co-author.

Squad I-48; research and report co-author.

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Brookhaven National Laboratory Upton, NY 11973

BACKGROUND

It became apparent by the end of November 1996, about four months into the FBI's criminal investigation, that no aircraft debris recovered to that time had clear indicia of a high explosive event, although evidence recovery (i.e. ocean trawling for aircraft debris) and subsequent examination by bomb technicians for such indicia was continuing. In the face of no "classic" explosive artifacts, little forensic documentation or guidance on large-body aircraft missile engagements, and no supportable mechanical or operational explanation for the crash of Trans World Airlines (TWA) Flight 800, FBI management decided that "...any investigative or scientific avenue that was reasonable and which could assist in providing a factual cause of the incident should and would be pursued."²

To supplement the already extensive scientific effort the FBI Laboratory was applying

January 7,1997, case file

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¹Bomb technicians and FBI Laboratory scientists often cited, based on their experiences, the associated presence of variable-depth surface pitting, melting, penetrations, spalling, and hot gas impingement as examples of classic explosive artifacts.

²FBI New York Electronic Communication by SSRA 265A-NY-259028 serial 1186.

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to the investigation, provide scientific peer review and a fresh perspective, and to have access to a nearby federal government facility with materials science experts capable of performing advanced imaging examinations in short turnaround, Brookhaven National Laboratory (BNL) was approached for assistance, resulting in a favorable response.³ The NTSB and FBI Laboratory concurred with FBI New York Office's proposed utilization of BNL and participated in several meetings with BNL scientific staff during January and February 1997 held at both the Director's Office, BNL, and Hangar Six, Naval Weapons Industrial Reserve Plant, Calverton, New York (Calverton facility). During these meetings, participating BNL scientists were briefed on the investigation, introduced to FBI and NTSB investigators, and advised investigators on the scientific capabilities of their labs, offering gratis support that resulted in the efforts reported herein.⁴

At Calverton, the scientists were briefed on, among other topics, the evidence recovery, debris identification and placement, reconstruction projects, scientific observations, and NTSB's crash sequence theory. They were escorted through the TWA 800 debris and reconstruction projects.

Three projects ultimately resulted from this collaboration: metallurgical peer review of the wing center section failure assessment, chemical analysis of an unknown "splattered" material, and examinations of selected evidence items for indicia of high energy penetration. The scientists' project reports are at Attachments (1), (2), (3), and (4).

The cursory metallurgical peer review was conducted by Department of Advanced Technology, BNL. His task was to provide an unbiased review of metallurgical findings. No analysis or microscopic examinations were conducted.

memorandum, Attachment (1), is self-explanatory and will not be addressed further.

The unknown "splatter" material was found at various locations on the top of the wing center section. This location was significant because of the early role the wing center section had in NTSB's sequence theory.⁵ Several specimens were taken for analysis by NTSB and

⁵NTSB's sequence theory points to the ignition of the fuel-air mixture in the center wing tank, part of the wing center section, as the event that led to the catastrophic airframe failure. The ignition source is as of the date of this report unknown. See NTSB Metallurgy/Structures Sequencing Report 97-38. As of the date of this report, NTSB was still studying the relationship and implication the splatter material had to the overall mishap



³December 1996 meeting between Senior Supervisory Resident Agent. FBI; Special Agent FBI; and FBI; and Planning and Policy, Brookhaven National Laboratory.

⁴As a preface to discussions about the investigation, BNL personnel were informed of the sensitivity of the case regarding possible criminal prosecution and civil litigation. They agreed to restrict discussion and dissemination of related subject matter to those involved in the investigation. None of the non-government NTSB party members (e.g. Boeing, TWA) were involved in the BNL activities.



the FBI, one of which was submitted to National Synchrotron Light Source, BNL. Once a preliminary chemical identification was done, several control specimens from known aircraft structure were submitted for comparison. Attachment (2), comprehensively documents his analysis and will not be addressed further.

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conducted materials science examinations, primarily looking for high energy penetrations.° The interest in high energy penetrations stemmed from the development of several hypotheses of criminally initiated events that might have accounted for the lack of a classic explosive signature. Among these hypotheses were the possibilities that a missile warhead detonated at some distance external to the TWA 800 airframe, resulting in only a few warhead fragment penetrations of the aircraft, or that an explosive device detonated in or on the aircraft but the explosive signature was, for some reason, masked or attenuated. If either of those scenarios were true, then the evidence of an explosive fragment penetration--amongst the myriad penetration sites throughout the airframe--might be discovered under microscopic examination.

first examination was on a non-TWA 800 penetration site that Boeing made by firing a steel projectile through an aluminum alloy plate. examination revealed a presence of steel, apparently transferred to the aluminum plate by the steel projectile, anecdotally supporting the possibility of discovering microscopic material from a penetrator in a penetration site. Her report, Examination of the Boeing Test Sample: The Fracture Surface of Al 2024 Alloy Following Penetration by Steel Projectile @ 3000 ft s-1 is at Attachment (3).

Subsequently, two evidence items associated with the TWA 800 debris were submitted for examination because of their damage features. FBI evidence item 1B-377 was a penetration site in the vicinity of the L3 door. It appeared to have been made by a penetration directed into the fuselage. As well, the surrounding fuselage skin had various degrees of scraping, dimpling, and fracturing. The area was examined by FBI bomb technicians, yielded no identification of an explosive signature, so the site was cut from the fuselage and submitted to whose report is at Attachment (4).

The other item of intriguing appearance was 1B-423. This piece was recovered during trawling. There was no way to confirm that it came from the TWA 800 aircraft, but bomb technicians pulled the item aside because of its spike-feature fractures. To discover the item's composition and to search for possible transferred material, it was subjected to microscopic examination by

sequence.

⁶High energy in this context denotes a penetrant of such mass and/or velocity sufficient to leave certain characteristics in the penetration site, such as those identified in Boeing Test Sample report at Attachment (3).



Two other items, 1B-410 and -28, were submitted for identification because of their dissimilarity in appearance with TWA 800 debris, not for any particular damage features. This examination was an attempt to discover any probative characteristics in the material and was performed by BNL because of their close proximity to Calverton and fast turnaround.

METHOD

All items were tracked and documented as evidence. Unknown evidence items submitted for examination remained in the custody of SA. Throughout. Items of known identity or samples extracted from an item were released into the custody of Brookhaven personnel only when necessary. The following four items were examined by Materials Science, BNL:⁷

1B-28

This item, one of 20 similar pieces removed during autopsy of Suffolk County Medical Examiner's case was approximately 5mm in diameter and charcoal colored. The item was polished and then subjected to an energy dispersive spectrometer (EDS) analysis to determine its chemical composition.

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1B-377

The item was a 5×5 cm square piece with a penetration at its center, cut from the fuselage aft of the L3 door. EDS analyses were performed on both of its fracture surfaces, the external coated areas, and indentations. The item was also analyzed using a synchrontron x-ray fluorescence microprobe.

1B-410

The item was a sliver of grey uncoated material that was submitted to BNL for an EDS analysis. No further tests were required.

1B-423

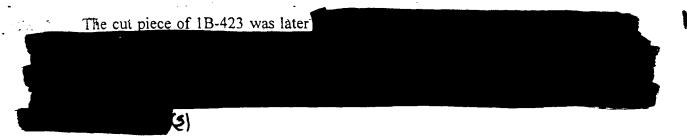
Item 1B-423 was transported to BNL for testing. An EDS analysis was performed on three areas: the spike-feature fracture surface, the green colored area, and the base of the "teeth" at some apparently melted areas. A small piece was cut from 1B-423 and mounted in an epoxy resin to facilitate alloy identification. This cut piece was released into



⁷Attachment (4), Materials Analyses of Samples from TWA Flight 800.



custody and subsequently returned to the FBI.



SA conducted an investigation to determine probable airframe sources of item 1B-423. His efforts are delineated in the Analysis/Conclusion section.

FACTUAL RESULTS

See attached reports.

ANALYSIS/CONCLUSION

All items, excepting 1B-423, were satisfactorily discussed in the BNL reports. No probative characteristics were discovered. The origin of item 1B-423 remained inconclusive after initial BNL testing, however.

On October 6, 1997 a provided further information concerning the use of titanium compounds. He stated that the fuel pumps on this type of airplane engine would not contain titanium and would more likely be made of mostly aluminum parts. The blades of the

⁸See memorandum (not attached) dated September 29, 1997, by Defensive Systems Office, Missile and Space Intelligence Center, Defense Intelligence Agency, and supporting documents. This report is on file under Metallurgical Analyses, DIA.



engine were suggested as possible matches to item 1B-423. He further stated that other areas of the airplane could also contain titanium compounds, such as the hydraulic or pneumatic pumps.

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A total of fourteen different pieces were selected from the engine debris as having a similar appearance to 1B-423. On October 3, 1997, a sample was taken of each piece, assigned an item number and presented to BNL, for composition comparison with 1B-423. The fourteen samples were as follows:

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- 1) 1B-572, item 167, a grey metal piece approximately 3.0cm x 1.5 cm x .5 cm., taken from the casing of a fuel pump.
- 2) 1B-573, item 171, a silver and grey metal piece, 1.5cm x .5cm x .4cm, taken from an apparent engine support strut.
- 3) 1B-573, item 172, a silver and green colored metal piece, approximately 1.0cm x .5cm x .4 cm taken from the casing of an engine.
- 4) 1B573, item 173, a green and grey metal piece, 1.5cm x .75cm x .5cm, taken from an engine propeller blade, which came from engine number four.
- 5) 1B573, item 174, a green metal piece approximately .6cm x .5cm x .3cm, taken from an engine propeller blade, which possibly came from engine number three
- 6) 1B573, item 175, a silver colored piece of metal approximately 1.0cm x .6 cm x .2cm, taken from an engine propeller blade, which possibly came from engine number three.
- 7) 1B573, item 176, a silver colored piece of metal, approximately 2.5cm x .5cm x .2cm, taken from and engine blade, which possibly came from engine number one.
- 8) 1B573, item 177, a grey and green metal piece approximately .6cm x .5cm x.3cm, taken from an engine blade mount, which possibly came from engine number three.
- 9) 1B573, item 178, a grey and green metal piece approximately $1.0 \,\mathrm{cm} \times 1.0 \,$
- 10) 1B573, item 179, a silver and grey metal piece approximately .75cm x .4cm x .2cm taken from an engine blade mount, which possibly came from engine number four.
- 11) 1B574, item 180, a green and grey metal piece approximately 1.2cm x 1.0 cm x .2cm taken from the casing of engine number four.
- 12) 1B574, item 181, a green and grey metal piece taken from an outer engine ring from engine number three, approximately 1.1cm x .5cm x .2cm.



- 13) 1B574, item 182, a green and grey metal piece, approximately .5cm x .75cm x .4cm, taken from a ring near the rear of engine number two.
- 14) 1B574, item 183, a green and grey metal piece approximately 1.0cm x .5cm x .25cm, taken from a large tube-shaped support.

These samples were examined using EDS in the same manner as item 1B-423. Two of the samples (Item 181 and Item 183) were found to have compositions of Ti-6.2Al-2.7Sn, which is consistent with AMS 49XX series alloys and most probably the same material as item 1B-423.9

On October 31, 1997

Pratt and Whitney Aircraft, stated during a telephone conversation with SA

that AMS 4966 was used in the engines of TWA Flight 800 for various parts, two of which were the engine rings and radial supports. He provided fax copies of the Pratt & Whitney Parts Catalog, which indicated the location of these parts. Theses schematics also match the locations from which Items 181 and 183 were taken.

Based on the probable composition match described above, it is a reasonable conclusion that item 1B-423 was from a TWA Flight 800 aircraft engine.

ATTACHMENTS

(1) October 27, 1997 memorandum by Department of Advanced Technology, Environmental and Waste Technology Center, Brookhaven National Laboratory.

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- (2) Report of Infrared Microscopic Analysis of Items # 62 and MM7, by National Synchrotron Light Source, Brookhaven National Laboratory.
- (3) Examination of the Boeing Test Sample: The Fracture Surface of Al 2024 Alloy Following Penetration by Steel Projectile @ 3000 ft s⁻¹, by et al.
 - (4) Materials Analyses of Samples from TWA Flight 800 and Appendix I, by

⁹See Attachment (4), Appendix I.

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October 27, 1997 memorandum by Department of Advanced Technology, Environmental and Waste Technology Center, Brookhaven National Laboratory

ATTACHMENT 1

SECRET



BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

Department of Advanced Technology Environmental & Waste Technology Center

DATE:

October 8, 1997, Revised October 27, 1997

TO:

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FROM:

SUBJECT: Flight 800 Review

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As previously discussed in my May 2, 1997 memorandum to you (attached), here are my impressions and observations regarding the Flight 800 investigations:

- 1) All of the personnel that I have interacted with during my review (either FBI or N iSB) have been competent, capable and dedicated to determining the cause of the aircraft disaster.
- 2) My review consisted of a walk-through at the hanger, inspection of wreckage and evaluation of the data and test results that have been generated to date. The following documentation was reviewed:
 - A) NTSB Metallurgist's Factual Report No.97-81, dated April 29, 1997.
 - B) NTSB Metallurgist's Factual Report No.97-82, dated April 22, 1997.
 - C) NTSB- Metallurgist's Factual Report No.97-85, dated May 2, 1997.
 - D) NTSB- Metallurgy/Structures Sequencing Report No.97-38, dated April 8,1997.
- 3) After reviewing the generated data, I re-inspected the wreckage for sequencing of events.
- 4) Observations and review of the aforementioned documents are consistent with the NTSB appraisal that the blast initiated in the center fuel tank area, somewhere in the vicinity of spanwise beams 1 and 2. The extensive reconstruction of the plane and detailed mapping of the recovered components substantiate this hypothesis.
- 5) Comparison of the recovered pieces to metal having received the blast of a missile, tend to significantly diminish the theory that the plane was shot down by a missile.



6) The apparent directionality of the blast did cause me some initial consternation. There did not appear to be any significant structural weakness or flaw that would induce the resultant fuel tank expansion in a "forward-port" direction. I am not an explosives expert by any means, but it seemed to me that a tank would have a tendency to blow outward in a more omni-directional mode after the appropriate pressure had built up upon ignition. This did not, by observation, appear to be the case. I have since had discussions with one of the BNL combustion/explosion experts and he assured me that the point of ignition for the incident could have been in a different location than the area where the explosion occured. So...

In conclusion, it appears that although a thorough and comprehensive evaluation has been performed by all parties involved, only the location of the explosion is reasonably fixed, while the cause of the explosion is still an open issue (mechanical failure, pre-meditated induced failure, etc.).

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Report of Infrared Microscopic Analysis of Items # 62 and MM7, by

National Synchrotron Light Source, Brookhaven National
Laboratory

ATTACHMENT 2





Report of Infrared Microscopic Analysis of Items #62 and MM7

National Synchrotron Light Source Brookhaven National Laboratory, Upton, NY 11973

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Summary overview

Small quantities of material from the TWA 800 flight aircraft were brought to the NSLS by FBI Agent The intention was to identify materials or correlate unknown materials from one category with known materials from another category. Two groups of evidence materials were investigated, one (item 62) from known aircraft components, the other (item MM7) of unknown origin.

Infrared spectroscopy measurements were performed to compare materials from each item. Spectra for the main constituent of item MM7 (a rubbery / elastic material) were found to match spectra taken from a foam-like material of item 62. Spectra were also take from what appeared to be fine glass-like fibers imbedded in the foam of item MM7, and compared to glass-like fibers from item 62. A good match was not obtained, possibly due to differences in the fiber diameters between the two item categories (smaller for item MM7).

Infrared microspectroscopy

Infrared microspectroscopy is a non-contact, non-destructive method for characterizing the chemical content of small specimens. The particular spectral range spans wavelengths from 2.5 microns out to nearly 20 microns. This corresponds to the frequency range (measured in wavenumbers, the inverse of the wavelength in cm) from 500 cm⁻¹ to 4000 cm⁻¹. These frequencies match many of the bending or stretching vibrations that occur in complex organic (and inorganic) materials, leading to the absorption of light. Since some of these vibrational frequencies vary with even small changes in molecular structure, a mid-infrared absorbance spectrum can be a sort of "molecular-fingerprint" of a material. When spectroscopy is combined with microscope optics, small sample areas can be isolated and measured. The high brightness synchrotron infrared source allows specimens just a few microns in size to be measured.

The measurements reported here were performed using both a conventional infrared source and also with the synchrotron source. The latter proved to be important for obtaining good quality spectra from the small glass-like fibers, which were only ~ 3 microns in diameter.

Evidence items - visual description

Item 62 was described as a selection of material from known systems of the aircraft, i.e., their source location was understood. The selection contained irregularly shaped pieces of a soft, porous, foam-like material ("bulk foam") and a thin, semi-rigid, layered material composed of a foam layer ("layer foam") attached to a fiberglass-epoxy composite structure ("epoxy material" and "glass fibers"). The bulk foam and foam layer were both a light yellowish brown in color with the latter darkened in places. The epoxy was more yellow in color. Partially imbedded in the epoxy material were thin glass-like fibers, arranged in a square weave pattern.

Item MM7 was described as material of unknown origin. It consisted of small millimeter-sized) pieces of a heterogeneous rubbery/elastic material formed into an interconnected network.



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The color ranged from yellow-brown to nearly black, giving the impression of fire or heat exposure. Small white polycrystalline grains were occasionally found imbedded in the material, as well as a few glass-like fibers.

Microspectroscopy method

Infrared spectra were obtained from the materials of items 62 and MM7. In most cases, a small section of material was squeezed between clean sections of KBr windows to provide a sample thin enough for a transmission measurement. The samples were translucent, and sample regions were chosen that had no evidence of inhomogeneity. Actual thicknesses were not measured or recorded, but were estimated at about 5 microns. Reference spectra were collected through clean areas of the KBr windows. The transmission data for all materials, except the glass-like fibers, were converted into absorbance units. Spectra for the reference materials of item 62 are shown individually in figures 1-4. Spectra were typically recorded for several locations in one type of specimen. The foam layer material had blackened regions, which was assumed due to the charring effects of exposure to fire, and a spectrum from both light and blackened regions were collected (see Figure 2).

Data: visual images and infrared spectra

Item 62 - reference specimens

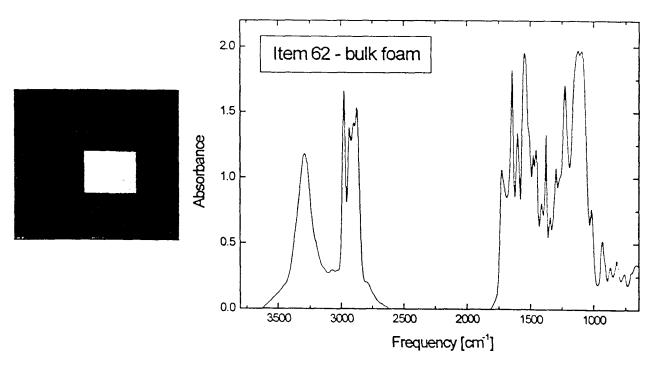


Figure 1: (Left) Visual image of a bulk foam section from item 62, pressed between KBr plates. The foam material is translucent, and occupies the region bordered by irregular dark margin. The highlighted rectangular region represents the 45 micron by 60 micron area probed with the infrared microspectrometer. (Right) Infrared absorbance spectrum from the bulk foam section of item 62.

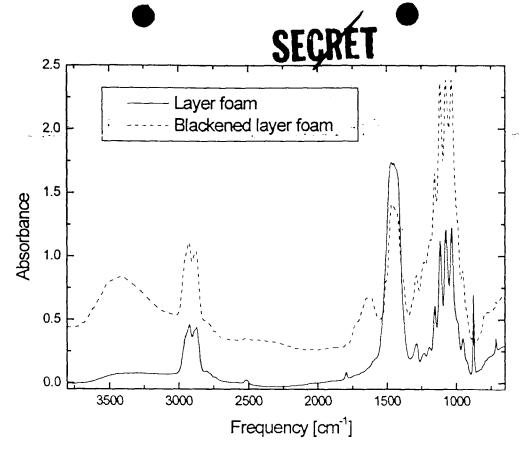


Figure 2: Item 62 - absorbance spectra of the thin layer foam material, both light brown and darkened regions

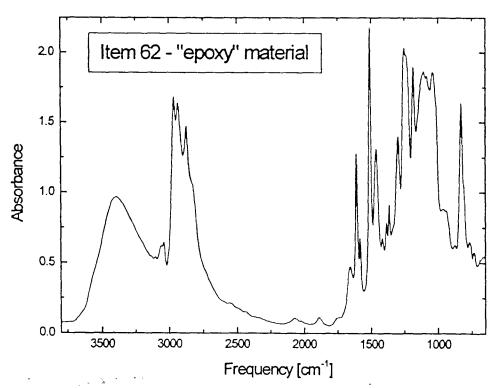
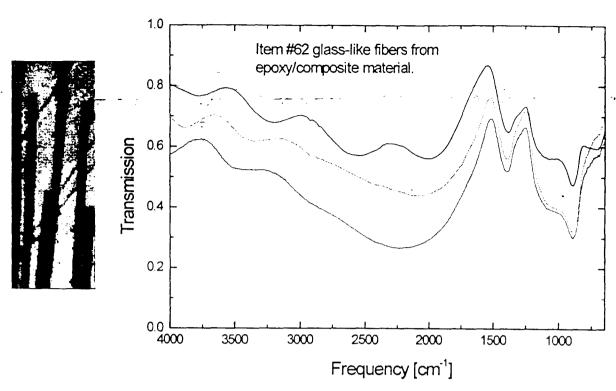


Figure 3: Item 62 - absorbance spectra from the epoxy-like material.





<u>Figure 4:</u> Optical image of item 62 glass-like fibers (left), and transmission spectra for several such fibers from item 62. Three measurements of different fiber locations were performed to check reproducibility.

Item MM7 specimens

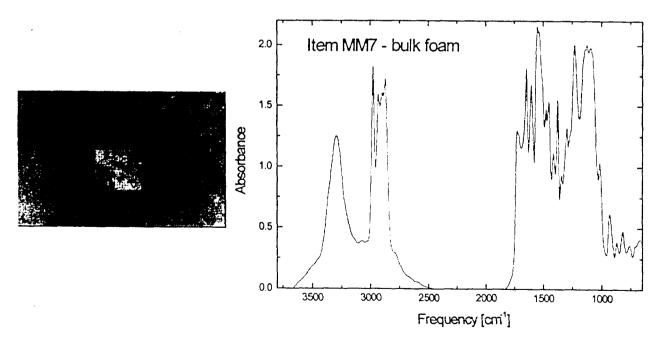


Figure 5: Optical image (left) and absorbance spectra (right) of compressed light brown foam material of item MM7. The highlighted area of the optical image shows the area probed with the infrared.



Spectra from other portions of the foam material, though darker in color, yielded nearly identical spectra..

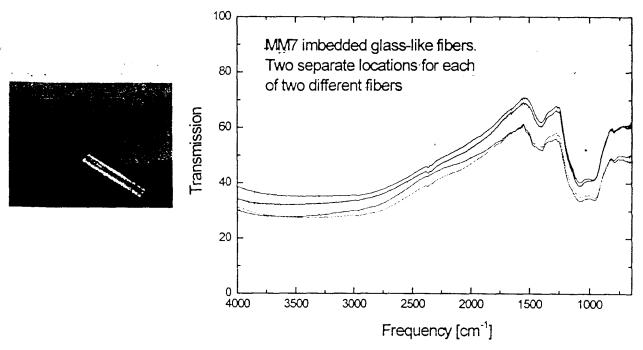


Figure 6: Optical image of a glass-like fiber with IR measure region highlighted(left), and transmission spectra for item MM7 - glass-like fibers (right). Two measurements each of two different fibers.

Comparisons & interpretation

With the exception of the glass-like fibers, the spectra are consistent with synthetic organic compounds. Since we do not maintain an extensive spectral library (though such libraries exist elsewhere), we have not attempted a detailed analysis of the spectra nor matching to actual materials. Instead, we compare spectra of item MM7 (unknown origin) components with item 62 (known aircraft origin) components and look for matching spectra.

A quick inspection reveals that the foam/gum material of item MM7 closely matches the bulk foam material of item 62. Each absorption feature occurs at the same frequency, and the relative strengths of the various absorptions are also relatively close. This is shown in Figure 7, below.

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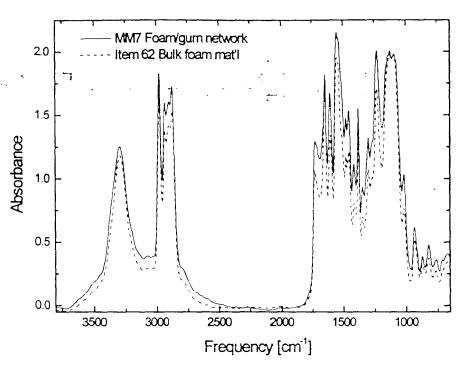


Figure 7: Spectral comparison for MM7 bulk foam and item #62 bulk foam illustrating the close match in spectral properties.

We can also show substantial disagreement between item MM7 foam and the other specimens from item 62. Neither the epoxy material nor the layer foam material have spectra that agree with the MM7 foam, as can be seen in Figure 8.

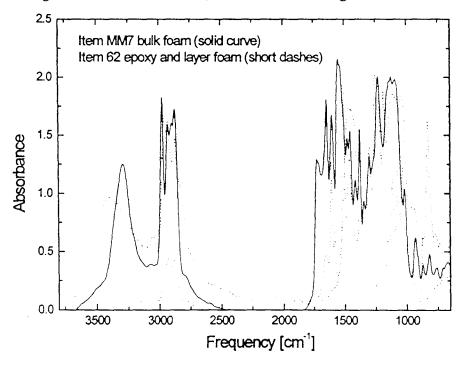


Figure 8: Spectral comparison of item MM7 bulk foam with item 62 epoxy-like material and item 62 thin layer foam (light brown or dark/black). Strong differences among the spectra indicate dissimilar material composition.



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Finally, the glass-like fibers of MM7 have general characteristics similar to fibers in #62. The absorption (transmission minimum) near 1000 cm⁻¹ is consistent with silica, and suggests both are simple glass fibers. However, differences in the MM7 and #62 spectra (oscillation period, variations through absorption region, overall frequency dependence) suggest MM7 fibers are smaller than item #62 fibers. This could be checked by visual microscopy.

Summary

Infrared spectra were recorded for materials from evidence items 62 and MM7. Chemical identification was not attempted due to a lack of spectral libraries at this facility. The spectra for the main constituent of item MM7 - a foam / gum network - were found to agree closely with the bulk foam material of item 62. The glass-like fibers of items MM7 and item 62 produced spectra consistent with glass material. However, differences in the spectra - interpreted as due to multiple reflection / interference effects - suggest the fibers have different diameters. Direct (visual microscopy) of the fibers should confirm the different diameter. Finally, the small white polycrystalline grains found in item MM7 (but not item 62) produced spectra consistent with basic salt.

Examination of the Boeing Test Sample: The Fracture Surface of Al 2024 Alloy Following Penetration by Steel Projectile @ 3000 ft s⁻¹, by et al.

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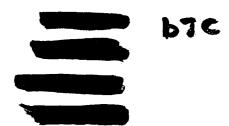
ATTACHMENT 3



Examination of the Boeing Test Sample: The Fracture Surface of Al 2024 Alloy Following Penetration by Steel Projectile @ 3000 ft s⁻¹

Corrosion Group, Materials Science Division, Brookhaven National Laboratory

February 20th 1997

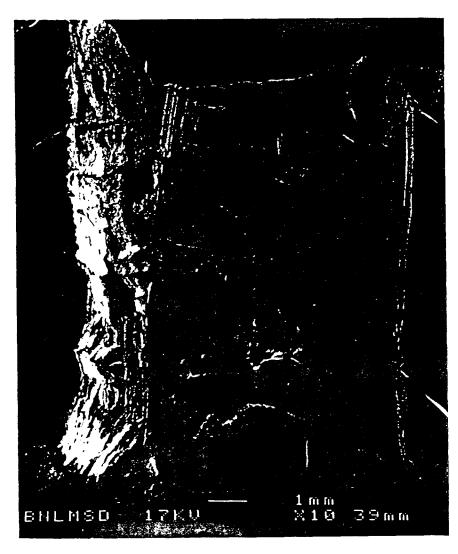




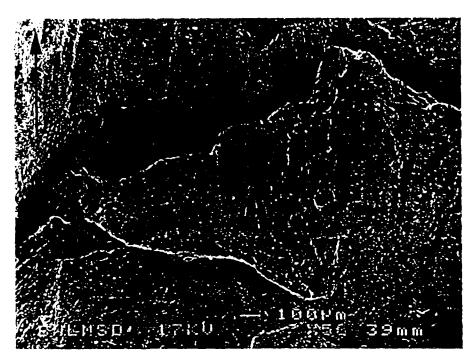
Optical Microscopic examination showed areas with distinctly different surface finishes. The general surface has a dull appearance and is sheared in the direction of the projectile motion. The resulting surface is "scale-like" with the cleaved plates pushed forward along the fracture surface (as shown in SEM micrograph - Fig. 1). Close to the entrance hole there were significant areas that had a much more shiny luster. These could be correlated to zones where surface melting had occurred during the impact. Metal extrusion occurs at both the entrance and exit and at first examination the direction of the projectile is not obvious. Thus it is important to establish whether deformation around the hole occurred under compressive or tensile forces.

Scanning Electron Microscopy of the surface clearly shows the sheared surface along the direction of the projectile: Figure 1 gives an overview of the entire fracture surface with the projectile direction indicated. Figure 2 shows a close up of one of the sheared platelets. Further examination showed areas where there is strong evidence of surface-melting and fluid like features are observed (Fig 3. middle). Figure 3 shows a series of micrographs taken along the fracture surface: the bottom figure is at the point of entrance and shows no unusual feature for cleavage of Al. The middle figure is close to the entrance on the fracture surface - the liquid appearance implies surface melting and a separate layer on the alloy surface. The amount of this material apparently decreases towards the exit possibly indicating a degree of cooling. Elemental analysis of the "melt-zones" shows a significant enrichment of Fe when compared to the base alloy (see Table 1), and there is strong evidence of metal transfer between the projectile and the target in these areas, i.e. during the surface melting, alloying between the Al 2024 and the mild steel occurs.



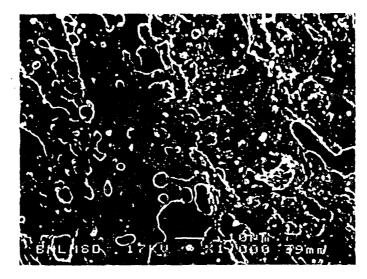


Al 2024 plate, cross-section of fracture surface

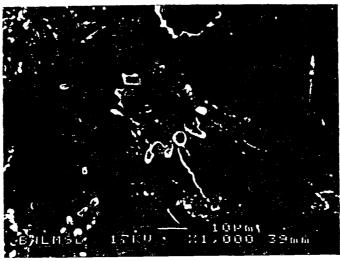


Al 2024 plate, sheared platelets in direction of fracture

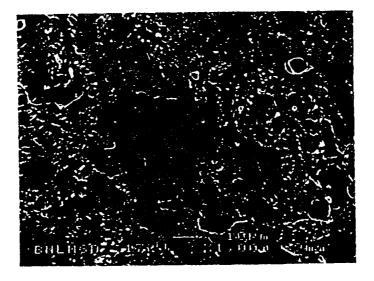
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cooler area near exit



"melt zone"
Fe-rich



classic shear surface



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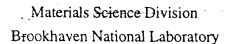
	Aluminum kα	Copper ka	Iron kα	Fe/Cu
	(counts)	(counts)	(counts)	4.
Base Alloy	63837	238		0
"melt-zone"	57434	307	969	3.16

Table 1. Integrated intensities of peaks in EDS spectra for aluminum, copper and iron. The iron/copper ratio is a good way of comparing the regions since the technique has a similar sensitivity to both iron and copper. The iron enrichment in the melt-zone is clearly evident.

Materials Analyses of Samples from TWA Flight 800 and Appendix I, by

ATTACHMENT 4

Materials Analyses of Samples from TWA Flight 800



Samples associated with TWA flight 800 have been examined, primarily for materials identification, using scanning electron microscopy with Materials Science Division). The objectives were to establish whether certain pieces were actually from the aircraft and to look for evidence of material transfer on fracture surfaces.

The chemical compositions of the samples were analyzed with a JEOL 6400 SEM configured to an EDS (Noran) series energy dispersive spectrometer and associated microanalyser. The accelerating voltage was 17 kV, the typical working distance was approximately 35-40 mm, and take-off angle was 40°. The net intensities for each peak were processed in *semi-quantitative* standardless mode (i.e. alloy standards were not measured) which uses ZAF (atomic number, absorption, fluorescence) corrections. (Micrographs of samples IB377, IB423 and IB28 were also taken but are not presented here - original data held by

Sample ID # IB377 (item 63) - penetration site on fuselage

A 5 x 5 cm square piece was cut from fuselage aft of L3 door, with the penetration at the center (~1.5 cm dia.). A primer coating and paint top-coat were intact away from the penetration site. Small indentations in the metal surface were observed around the penetration site. The sample was not examined in cross-section so quantitative analysis of the fracture surface were not obtained. (Further analysis of the fracture surface was to be carried out by the first transfer being may be misleading if the fracture surface is heavily corroded. In the case of an iron projectile evidence of surface melting on the fracture face can be lost after only 72 hours exposure to sea water. In this case, chemical analysis is critical in order to establish material transfer).

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SEM/EDS analysis was performed on both the fracture surface (as far as sample geometry allowed), the external coated areas, and the indentations (Figs 1-4). The fracture surface showed flat "mud-cracked" oxide features; chemical analysis indicated the presence of Al, trace amounts of Fe and Mg and large signals from typical salts (Na, Ca, Cl). Spectra from the painted areas were all consistent with the known coatings on the aircraft (from comparison with EDS spectra provided by manufacturer). No foreign material was observed.

In the case of sample IB377 the surface was also analyzed using the synchrotron X-ray fluorescence microprobe (for at beamline X26A of the National Synchrotron Light Source. The incident radiation was delivered at 45° to the plane of the sample as a 300 x 300 µm unfocussed white beam, and the fluorescence spectra were detected at 45° by a multi-element detector (Canberra). The Xray technique is more sensitive to trace elements but has a larger penetration depth (i.e. is less surface sensitive). Examination of the fracture surface was in general consistent with the SEM data except that small amounts of Cadmium were observed through the penetration surface. This is consistent with paint fragments dragged through (and deposited) on the penetration. Cadmium was also observed on the painted areas of the piece, and is commonly found in red pigments.

Sample ID # IB423 (item 92) - "spiketooth" - Unknown origin.

Metallic sample with spiketooth fracture surface characteristic of adiabatic shear during fast fracture. Evidence of high temperature exposure during failure indicated by areas of blue oxidized material and areas of apparent melting at the base of the "teeth". Olive green coloration of surface away from fracture.

A small piece of the material was cut from the original sample, mounted in epoxy resin and polished to 1 μ m finish using SiC and diamond paste. The alloy composition was determined to be ~ Ti - 5Al - 3Sn (weight %) - (Fig. 5).

EDS analysis was performed on three areas on the main spiketooth sample:

1. Fracture surface - (Fig. 6) Consistent with base alloy composition but, additionally some trace Fe, Cu was observed.

- 2. Green area- (Fig. 7) Spectrum is consistent with oxidation or base alloy material (O, Ti, Al, Sn and small trace of Ca observed).
- 3. Base of the teeth at apparent melted areas (Fig. 8) Again a trace amount of Fe is observed that was not seen on the bulk base alloy (as in 1).

This specimen shows evidence of fast fracture and possible transfer of Fe at the fracture surface. It should be noted however, that Fe is a common impurity in Ti alloys resulting from the extraction process (up to 0.2 wt. % for the most commonly used "Kroll" process - see Table 1 - from "The physical metallurgy of Titanium Alloys, The bulk alloy is possibly engine material used on the aircraft (49XX series Ti alloys) and further tests are presently underway in order to match the sample to actual engine pieces (see Appendix 1). Currently the origin of the piece remains unknown.

Sample ID # IB410 (item 86) - "fin"

Sliver of grey uncoated metal - Unknown origin

EDS spectrum of sample (unwashed) indicated the material to be Al based with Cu and Fe (consistent with a 2000 series alloy used in aircraft), additional peaks from salt contamination (Na, Ca, Cl, K, S, Mg) were also observed. No further tests were required.

Sample ID # IB28

Small charcoal colored particles (1 of ~20 similar pieces) measuring ~5 mm in diameter. On polishing the sample was orange colored and transparent. *Unknown origin*.

SEM analysis indicated that the material was multi-phase having a base matrix containing Al and Ti (Fig. 9). The sample showed significant charging under the electron beam indicating that it is a very poor conductor - i.e. not metallic. Three other distinct areas could be observed, two were similar to the matrix but contained significant amounts of Zr (Figs. 10,11), the other was mostly Al with Ca, Ba and Ce (Fig. 12).



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- Figure 1. EDS Spectrum of IB377 (item 63) Fracture surface.
- Figure 2. EDS Spectrum of IB377 (item 63) Green "primer" area.
- Figure 3. EDS Spectrum of IB377 (item 63) Red paint.
- Figure 4, EDS Spectrum of IB377 (item 63) Indentation around penetration site.
- Figure 5. EDS Spectrum of IB423 (item 92) Polished sample base alloy
- Figure 6. EDS Spectrum of IB423 (item 92) Fracture surface.
- Figure 7. EDS Spectrum of IB423 (item 92) Green area.
- Figure 8. EDS Spectrum of # IB423 (item 92) "Melt" area at base of teeth.
- Figure 9. EDS Spectrum of IB 28 Matrix
- Figure 10. EDS Spectrum of IB 28 Particulate 1
- Figure 11. EDS Spectrum of IB 28 Particulate 2
- Figure 12. EDS Spectrum of IB 28 Particulate 3

Table 1 — Total Impurity Contents of Iodide- and Kroll-Process Titaniums in Weight %

Element	lodide Ti	Kroll Ti	
	100106-11		
Mg	0.01	0.13	
Si	0.01	0.05	
Al .	0.02		
Fe	0.01	0.20	
Ni	0.01	3,23	
Со		0.02	
Cr	0.01		
Mn	0.005	0.02	
С	0.01	0.08	
N	0.02	0.04	
0	0.02	0.11	

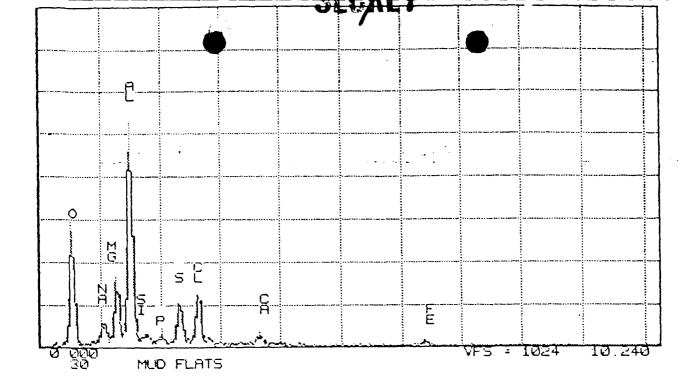


Figure 1. EDS Spectrum of IB377 (item 63) Fracture surface.

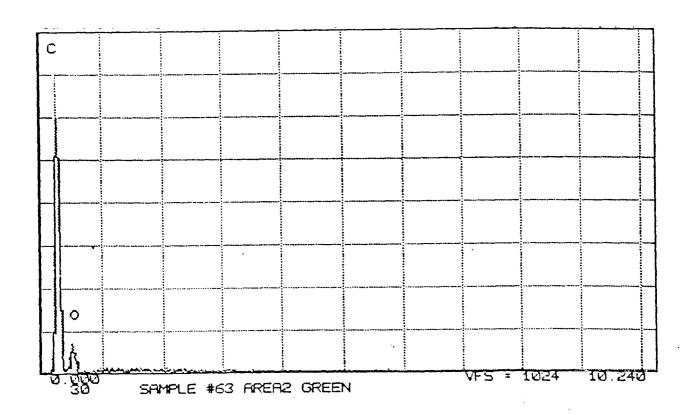


Figure 2. EDS Spectrum of IB777 (item 63) Green "primer" area.

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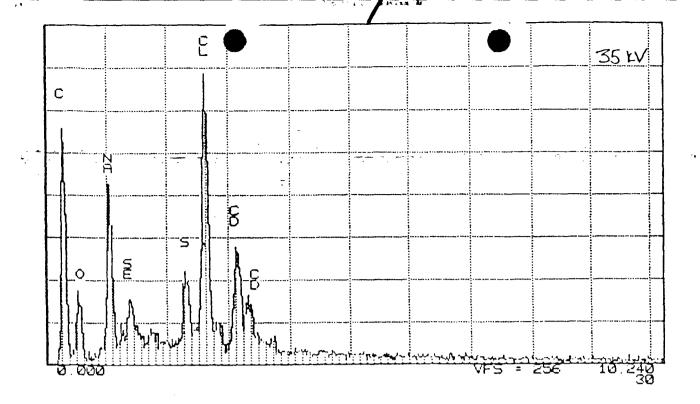


Figure 3. EDS Spectrum of IB377 (item 63) Red paint.

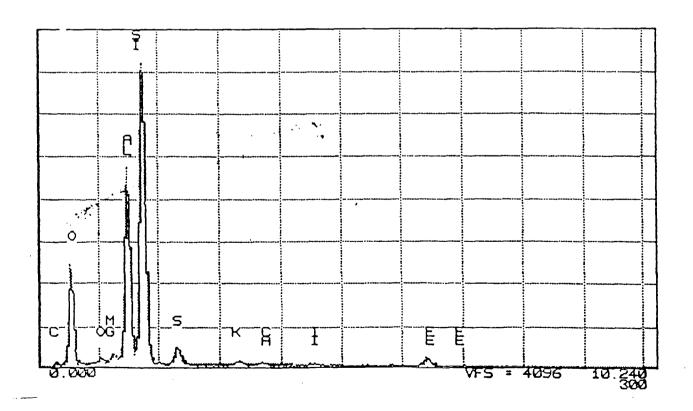


Figure 4. EDS Spectrum of IB377 (item 63) Indentation around penetration site.

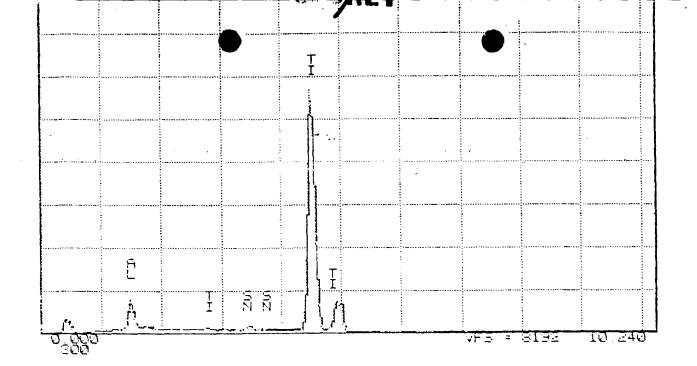


Figure 5. EDS Spectrum of IB423 (item 92) Polished sample - base alloy

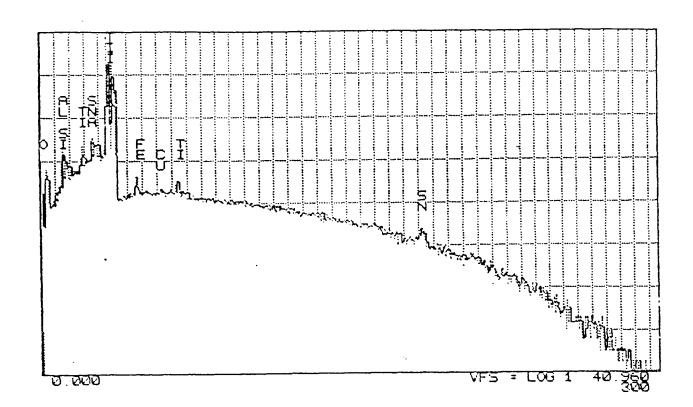


Figure 6. EDS Spectrum of IB423 (item 92) Fracture surface.



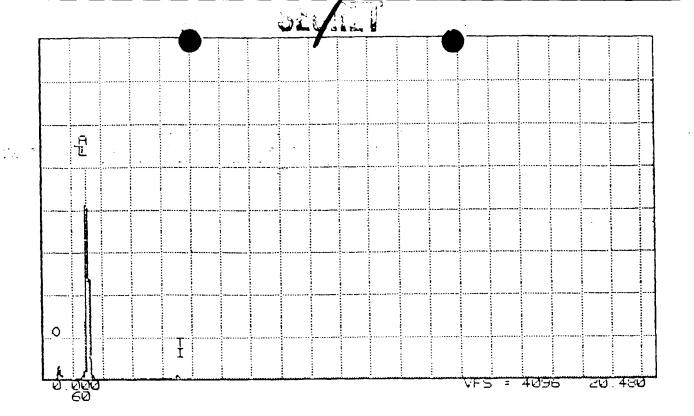


Figure 9. EDS Spectrum of IB 28 - Matrix

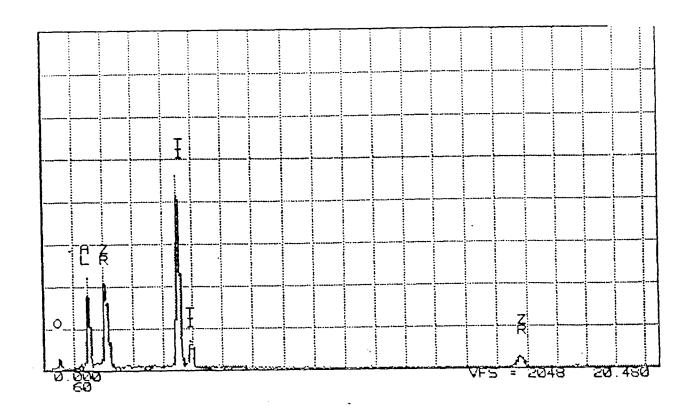


Figure 10. EDS Spectrum of IB 28 - Particulate 1

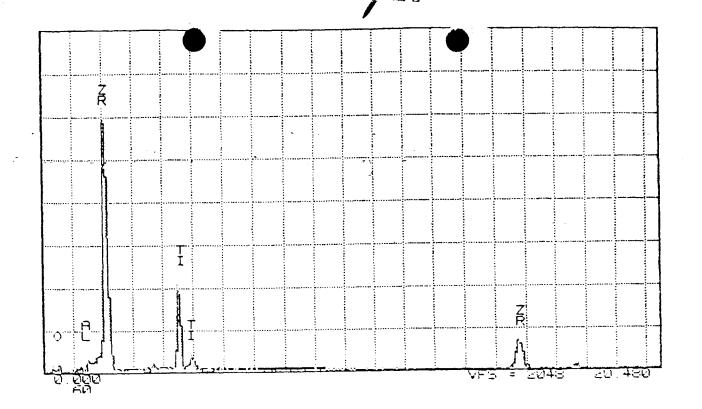


Figure 11. EDS Spectrum of IB 28 - Particulate 2

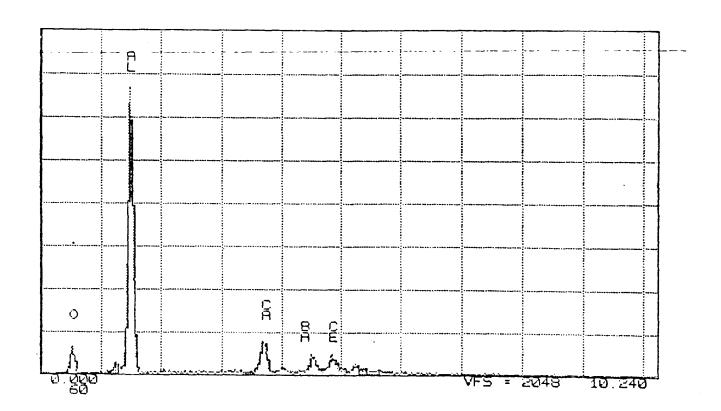


Figure 12. EDS Spectrum of IB 28 - Particulate 3

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Appendix I

Samples tested for comparison to item # 92 (IB423)

Selected pieces of recovered aircraft engine material were examined using EDS as described previously. Composition of IB423 was \sim Ti - 5Al - 3Sn (weight %), most likely a 49XX α -phase alloy.

<u>Item 130</u> - 'compressor blade'. Grey metal with greenish oxidation product. Samples mounted in epoxy resin and polished to 6 μ m finish with diamond paste. Semiquantitative EDS analysis showed the material to be a Nickel based alloy with a composition of Ni-13.5Cr-6.2Al-5.7Mo-2.3Nb-0.6Ti (Figure A1).

Items 167-183 - samples taken from engine casing, supports and blades. All samples are qualitatively similar in appearance to item IB423. Samples were mounted in epoxy resin and initially ground on a rotary sander. At this stage it was easy to differentiate between the hard and soft alloys (the Titanium alloys are likely to be significantly harder than Aluminum or Nickel alloys). Two samples (181 and 183) were selected for further testing and were polished to 1 μ m diamond finish.

Samples 181, 183 - samples from outer engine ring (#3) and engine radial support respectively. EDS spectra for the two samples were identical (Figure A2 shows the data for #181). The composition was determined to be Ti-6.2Al-2.7Sn. To within the error of the measurement this is consistent with the 49XX series alloy i.e. is most probably the same material as item 423 (note that there is only one common ternary Ti-Al-Sn alloy produced).



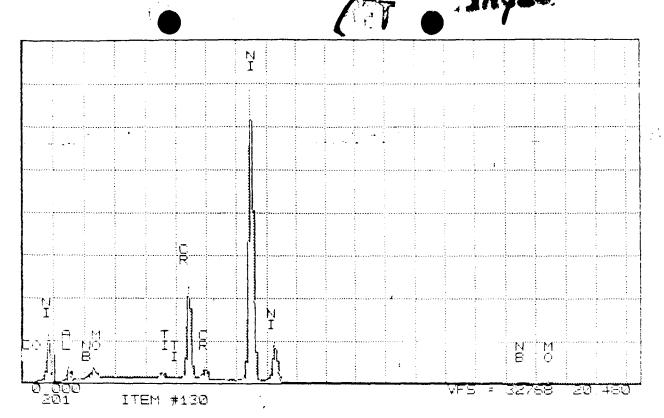


Figure A1. EDS spectrum of sample 130

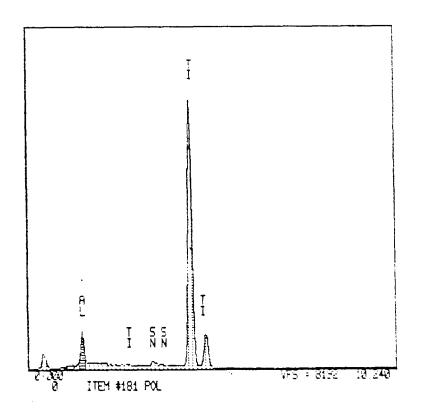


Figure A2. EDS spectrum of sample 181

FEDE AL BUREAU OF INVENTIGATION

Precedence: ROUTINE Date: 03/13/1997 Attn: SSA T To: New York SSAT From: New York FBI Command -Post, Calverton Contact: SA (516) 369-3313 Approved By: Drafted By: Case ID #: 265A-NY-259028 (Pending) Title: UNSUB(S); EXPLOSION OF TWA 800; 7/17/96 AOT-IT-EOD; OO: NEW YORK Synopsis: Encloses FD-302s documenting submission of an unknown material and comparison samples to Brookhaven National Laboratory for analysis. **67€** Enclosures: Two FD-302s by SA regarding chain of custody, with investigation dates of 2/11 and 2/27/1997. Details: An unknown brown material, with the appearance of having been splattered, was discovered at various locations on the top of the Wing Center Section. Several specimens were taken to analyze and identify at different laboratories. The test specimen originally labeled by National Transportation Safety Board, as MM7 was released to Brookhaven National Laboratory (BNL) by SA 2/10/1997. Preliminary elemental study was performed, without conclusion. MM7 was later redesignated in the FBI evidence files as item 56 (after the enclosed FD-302 concerning MM7 was written). Subsequently, known material samples from aircraft structure around the extraction site of MM7 (item 56) were taken and secured as evidence items 58, 60, and 62. On 2/27/1997, the three known items were taken to BNL for comparative analysis with MM7. While MM7 was released to BNL custody, items 58, 60, and 62 remained in SA custody. 265A-NY-259028-SUB Only item 62, which is insulation foam around an environmental air duct, was examined. The BNL Physicists determined that there was a strong correlation between WITH/TEXT ALL INFORMATION CONTAINED WITH/OUT TEXT___

To: New York New York Re: 265A-NY-25928, 03/13/1997

spectroscopy characteristics of MM7 (item 56) and item 62. In other words, the brown material is probably made of the same substance as item 62, insulating foam.

Fibers in MM7, thought to be silica based (glass), did not correlate well with duct fibers in item 62. Further analysis is required on these fibers.

FEDERAL BUREAU OF INVESTIGATION FREEDOM OF INFORMATION/PRIVACY ACTS SECTION COVER SHEET

SUBJECT: TWA FLIGHT 800 REPORTS ON VICTIMS

265A-NY-259028

WAT: iaw

On July 25, 1996, National Disaster Medical System, advised the following:

He was told by Regional Medical Examiners Office, State of New Jersey, Newark, New Jersey, (201) 648-7259, that she observed an individual taking pictures in the morgue at the Suffolk County Medical Examiner's Office on July 24, 1996. She was described as being a

on July 26, 1996, was telephonically contacted and subsequently provided a fax picture of the only meeting that description. The faxed picture was indicated that she could not be absolutely certain because she had focused on the camera rather than the face which was covered by a mask. She camera rather than the hairstyle in the photo was consistent with the indicated that the hairstyle in the photo was consistent with the person she observed. She said that the woman had a cheap light-colored instamatic camera.

on July 26, 1996, was paged and she quickly returned the page to the Long Island Resident Agency (LIRA). She was told that she had been tentatively identified as an individual who may have taken unauthorized pictures of bodies in the morgue area. She denied having done so and stated that in the morgue area. She denied having done so and stated that she did not even have her camera with her. She was asked to identify her camera and she described it as a yellow disposal camera.

was advised that despite her statement she was being advised that the crash of Trans World Airlines Flight #800 was a federal investigation and any unauthorized use of photographs taken at the morgue would have serious can be reached at pager number ramifications.

ALL 1-13-00 SPS / TC / DIN

265A-NY-259028-FF

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FBI - NEW YORK

release to you.

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COUNTY OF SUFFOLK



ROBERT J. GAFFNEY SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF HEALTH SERVICES
MARY E. HIBBERD, M.D. M.P.H.
COMMISSIONER

DIVISION OF MEDICAL-LEGAL INVESTIGATIONS & FORENSIC SCIENCES
(OFFICE OF THE MEDICAL EXAMINER)



FAX TRANSMITTAL

To:

ADIC James Kallstrom

SAC Thomas Pickard 212 384-2745

8/3/96

From:

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HAUPPAUGE, NEW YORK 11787-4311
(518) 853-5555
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News Release...



from the Suffolk County Medical Examiner's Office

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Contact: Phone: Fax: Bldg. #487 N. County Complex Veterans Memorial Highway Hauppauge, NY 11787-4311

AUGUST 3, 1996 9:45 AM ...

FOR RELEASE: IMMEDIATE

UPDATE

Total Decedents Received by the Suffolk County ME's Office	188	
		:
Total Positive Identifications	181	
Total Positive Identifications with Family Notification	181	

Decedents with Positive Identification Families Have Been Notified

8/3/96

Last Name of Deceased	First Name of Deceased	Hometown	State	Country	Count
	·				
Grimm	Julia	Montoursville	Pennsylvania		1180
Loo	Patricia	Springfield	New Jersey		181

- END -



Date of transcription

FEDERAL BUREAU OF INVESTIGATION

On July 24, 1996, information do an individual named had been Suffolk County Medical Examiner's Office determined that he was Lewis County Sheriff's De	(SCMO). Investigation
attached to the State Emergency Management Contact with indicated that no person Working with or was authorized to be photographing anything World Airlines (TWA) flight 800 incident.	semo, (518) 457-2222, attached to his agency agency related to the Trans
On July 24, 1996, with the air disaster. He was asked if he individuals taking pictures and he providuals taken pictures. Took pictures and at Calvert three rolls of film.	led two additional names. had ctures at the Medical
On July 24, 1996, the Melville, New York (Not surrender film he had taken at the morgue that he had made an arrangement with Suffolk County, NY, to He refused to provide the Federal Bureau the film, but suggested that Shand Supervisory Special Agent (SSA) traveled to the Medical Examiner's Office and SSA Met. Advised the practice when official photographers were was asked if at any time he had automividuals to take pictures, to which he	return the film to him. of Investigation (FBI) nould be contacted. e and hat he had authorized oing so was a standard e not available. thorized any other
Receipts were given to and they were advised that they may or mareturned at a later date.	for their film ay not have the film 4-12-00 505/7c
Investigation on 7/24/1996 at Hauppauge, New Y	
File \sim 265A-NY-259028 SSA SIAW \sim 1aW \sim 7 ω -329 ω	Date dictated 07/24/1996

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FD-302a (Rev. 11-15-83)

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It should be noted that at no time did indicate why they had taken the unauthorized pictures.

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Agent (SA) Squad I-5/Long Island Resident Agency (LIRA), on July 26, 1996:

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At 9:00 AM, the writer received a brown envelop from who just arrived at John F. Kennedy International Airport (JFKIA) from Trans World Airlines (TWA) flight 885 from Tel Aviv. The envelop was marked for at the Suffolk County Medical Examiner's Office (SCMEO). stated that he received this package from

At 10:30 AM, the aforementioned envelop was hand delivered to at the SCMEO, Hauppauge, New York.

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Precedence: ROUTINEDate: 08/11/1996

To: New York

Attn: ASAC George H. Andrew

From:

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Approved By:

Drafted By:

Case ID #: 265A-NY-259028 (Pending)

Title: UNSUB(S);

EXPLOSION OF TWA FLIGHT 800;

JULY 17, 1996; AOT-IT-EID

Synopsis: Contact with NTSB representative.

Details:

was contacted regarding status of investigation and autopsies being conducted at the Medical Examiner's Office. Was also contacted regarding a database being put together in connection with the autopsy information, this will be addressed on a separate communication.

advised that the Medical Examiners at the SCMEO are not in receipt of any clothing worn by any of the victims. would like to have the ability to review this clothing to correlate injuries on the bodies with the apparel they were wearing.

advised that autopsies should be completed by the middle of this coming week. After the autopsies are completed, the team of medical doctors at the SCMEO, which consists of the Medical Examiner, an FAA Medical Doctor and a Colonel from the Military acting in a consulting role for the NTSB will conduct a quality review of the data and autopsy reports generated and initiate a force vector analysis. The force vector analysis will be a review of all the damage done to the victims thus far recovered in an attempt to determine and plot the various trajectories with which debris hit the bodies.

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involved in this review. Informed that this would be welcomed. Previous steps have been taken to have an investigator from the squad involved with this process.

was also interested in ensuring that the seats, seat backs, seat cushions, etc., were all thoroughly reviewed for any fragments of foreign objects that may be contained within. recommended the utilization of an X-ray machine to conduct X-rays on all seat cushions, seat backs, etc., to ensure that any foreign objects are removed from these items.

advised that foreign objects being removed by the medical examiners from the bodies of the victims have been provided to the FBI.

Review of FD-192s discloses numerous green sheets reflecting foreign material being removed from victims' bodies. These bodies are being identified through a body number code. Per FD-192s, these are being stored at the hazardous material room at Grumman.

If not already done so:

Attempts should be made to identify the fragments removed from the bodies as to particular plane parts and areas. This will be particularly useful when trying to conduct trajectory analysis and determine the origin of forces..

- Identify seats recovered thus far by seat location, conduct X-ray of the seats to ensure that no fragments remain in them.
- X-ray seat cushions recovered. Is it possible to match seat cushions recovered with the seats from which they came? Are any cushions being recovered separated. If not, when they are separated are they referenced to the seat from where they came?
- Identify clothing recovered thus far through the body number. Examine this clothing for trajectory analysis, remaining debris, etc.
- Assign an investigator from the task force to work with the medical doctors in conducting this review and coordinating the flow of information needed to perform and complete force vector analysis as described above.

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Deletions were made	pursuant	to the	exemptions	indicated	below	with no	segregable	material	available for
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FEDERAL BUREAU OF INVESTIGATION

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the <u>Sufflok</u> (e following inves deral Bureau of I County Medical Ex opauge. New York:	investigation on caminer's Office,	March 27, 19	97 at	67 C
In	answer to a Fede	ral Grand Jury S	Subpoena,		b3
	* 16.5	4-13-00 585/	2-TOW		
	UPLE VITTELT MINISTER	2	65A-NY-259028-	SUB FF3-	20 57 &
estigation on 3/27/97		AUGE, NEW YORK	17.1.302		
* 265A-NY-259028 SA		Date	dictated 3/31/97		

FEDERAL BUREAU OF INVESTIGATION FOIPA DELETED PAGE INFORMATION SHEET

208 Page(s) withheld entirely at this location in the file. One or more of the following statements, where indicated, explain this deletion.

Section 552		Section 552a
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Rule ((e) Federal Rules	运 (b)(7)(D)	
of Criminal Procedure	(b)(7)(E)	□ (k)(2)
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32 MRI 01300 1 FBINY FBINY #0009 1081901 R UUUUU ' * * * 181859Z APR 97 FBI "NEW YORK" (265A-NY+259028) (#) (T-46) " DIRECTOR FBI/PRIORITY/ 1LAS "" " '' Et //3540// 38: FBIHQ FOR SSA FITU; SSA *LOSIVES UNIT; LABORATORY."" SUECTY UNBUB(8) # EXPLOSION OF TWAMFLIGHT 8004 JULY 17, YOU AUT-IT-EIDE OUINY AS PART OF THE CONTINUING INVESTIGATION INTO THE CAUSE OF TORASH OF THE FLIGHT 800, NEW YORK HAS HIRED WHO ECIALIZES IN CORRELATING THE INJURIES AND/OR CAUSE OF DEATH 265A-NY-25902 SUB VICTIME AS THEY APPLY TO AIRCRAFT CABIN/STRUCTURAL DAMAGE. APR 1 2 1998

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TWO DE FBINY 0009 UNCLAS

VILL
VELOP GEOGRAPHICAL DISPLAYS AND ENHANCE THE FINDINGS OF NEW
CORMATION RECEIVED FROM THE SUFFOLK COUNTY MEDICAL
WHINER'S OFFICE, AS WELL AS THE RECENT MISSILE TESTING IN
CSON, ARIZONA THAT THE FBI LABORATORY EXPLOSIVES UNIT TOOK

NEW YORK IS AWARE THAT ALL FOREIGN MATERIAL FOUND IN OR
THE VICTIM BODY DURING THE AUTOPSY WAS/WERE HIGHLY
RUTINIZED BY FBI BOMB TECHS. HOWEVER, IN AN EFFORT TO FULLY
ISFY ALL AVENUES AS THEY RELATE TO THE MISSISE THEORY, NEW
REQUESTS ALL DOCUMENTATION AND ACTUAL SAMPLES TAKEN FROM
ESE TESTS FOR USE IN COMPARISON TO ACTUAL FRAGMENTS FOUND IN

IT SHOULD BE UNDERSTOOD THAT THE FORENSIC ANALYSIS IN
IS CASE IS ONLY USED AS AN INVESTIGATORY TOOL TO EITHER
PORT OR DISCOUNT A THEORY. THEREFORE, THE BODIES
EMSELVES DID NOT TELL US WHAT HAPPENED TO THIS PLANE.

AND TASK FORCE AGENTS WILL SEGIN THIS

ALYSIS THE WEEK OF APRIL 28 THROUGH MAY & AT THE GRUMMAN

CILITY IN CALVERTON, LONG ISLAND: NEW YORK WOULD APPRECIATE

Y INFORMATION PROVIDED FROM THE FBI LABORATORY TO AID IN

E THREE DE FRINY 0009 UNCLAS

IS ANALYSIS.

1N ...

Automated Serial Permanent Charge-Out FD-5a (1-5-94)

Case ID: 265A-NY-259028-FF3 Serial: 83

Description of Document:

Type : TELETYPE
Date : 04/18/97

Date: 05/08/97 Time: 09:43

4-13-00 DY SS/XLP/

. To : ATHENS, et al. From : NEW YORK
Topic: MRI 1125/108

Reason for Permanent Charge-Out:

INADVERTENTLY UPLOADED.

Employee:





United States Attorney
Eastern District of New York

ZWC:VC:atb F. #9603373 VC970004.6E

United States Attorney's Office 225 Cadman Plaza East Brooklyn, New York 11201

April 7, 1997

Special Agent Federal Bureau of Investigation 26 Federal Plaza New York, NY 10278

Re: Investigation Before the Regular Friday Grand Jury Impanelled on July 1, 1996

Dear Special Agent

Pursuant to Rule 6(e) of the Federal Rules of Criminal Procedure, I have written a letter dated April 7, 1997 to Chief Judge Sifton of the United States District Court for the Eastern District of New York, notifying him to whom I may be disclosing grand jury matters in the above-referenced investigation.

I am obligated by Rule 6 to advise you, and those to whom I have addressed a copy of this letter, as a potential recipient of grand jury information, of the secrecy obligations imposed by that provision. Rule 6(e) provides in relevant part:

6(e)(2) General Rule of Secrecy....
(A)n attorney for the government, or any person to whom disclosure is made under paragraph (3)(A)(ii) of this subdivision shall not disclose matters occurring before the grand jury, except as otherwise provided for in these rules.

265A-NY-259028-SUB FF3

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APR 2 5 1997

FBI-NEW YORK

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6(e)(3) Exceptions.

(A) Disclosure otherwise prohibited by this rule of matters occurring before the grand jury, other than its deliberations and the vote of any grand juror, may be made to....

(ii) such government personnel... as are deemed necessary by an attorney for the government to assist an attorney for the government in the performance of such attorney's duty to enforce federal criminal law.

(B) Any person to whom matters are disclosed under subparagraph (A)(ii) of this paragraph shall not utilize that grand jury material for any purpose other than assisting the attorney for the government in the performance of such attorney's duty to enforce federal criminal law.

Thus, grand jury matters disclosed to you in conjunction with your participation in this investigation should not be revealed to or discussed with anyone but an attorney for the government and the members of your agency receiving a copy of this letter. If you feel that such grand jury matters should be disclosed to additional individuals, please discuss this with me before making any such disclosure.

Very truly yours,

ZACHARY W. CARTER United States Attorney

Bv:

Valerie Caproni Assistant U.S. Attorney

(718) 254-6336

FEDERAL BUREAU OF INVESTIGATION FOIPA DELETED PAGE INFORMATION SHEET

Page(s) withheld entirely at this location in the file. One or more of the following statements, where indicated, explain this deletion.

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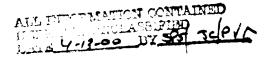
FEDERAL BUREAU OF INVESTIGATION

On the helew date Special Agent	New
York Office of the Federal Bureau of Investigation,	met with
Suffolk County Medical Examiner's Offi	ice (MEO),
Hauppauge, New York, telephone number (516)853-5555	. With the
authorization of provided	the MEO x-ray
records for the following MEO cases:	

All TWA Flight 800 Victims.

The above records were provided for official purposes in connection with the investigation involving TWA Flight 800 on 7/17/96.

The above records are to be returned to the MEO at the earliest possible time.



Date of transcription

5/2/97

Investigation on	5/1/97	at Hauppauge, New Y	/ork	
File # 265A-N	Y-259028 ST	JBS FD302 AND FF3	Date dictated 5/2/97	,
by SA		CG:cg)		676

This document contains neither recommendations nor conclusions of the FBI. It is the property of the FBI and is loaned to your agency; it and its contents are not to be distributed outside your agency.

FEDERAL BUREAU OF INVESTIGATION FOIPA DELETED PAGE INFORMATION SHEET

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Section 552			Section 552a
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of Criminal Procedure		(b)(7)(E)	\square (k)(3)
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U.S. Department of Justice



Federal Bureau of Investigation

In Reply, Please Refer to File No.

26 Federal Plaza New York, New York 10278 May 20, 1997

PJC

Suffolk County Medical Examiner's Office Building # 487, North County Complex Hauppauge, NY

- -_..

ATTN:

Dear



VIA FACSIMILE #

In connection with the official investigation concerning TWA flight 800, your office has previously provided substantial information and assistance. In continuing this investigation the following Medical Examiner (ME) numbers have been identified, however, their association with any of the

been identified, however, their association with any of the victims has not been determined. In all of the cases the ME numbers are associated with partial remains and may in some cases not be related to this investigation.

not be related to this investigation.

Your assistance in identifying any association of the attached list of ME numbers to the victims in this investigation is appreciated.

Special Agent is handling this aspect of the investigation and may be contacted at telephone numbers 516-369-3313 or Your response may be sent to facsimile number

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Sincerely

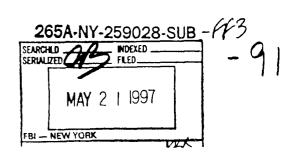
Supervisory Special Agent

For: James K. Kallstrom Assistant Director In Charge

FBI New York Office

Attached: 1 Page

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FEDERAL BUREAU OF INVESTIGATION FOIPA DELETED PAGE INFORMATION SHEET

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Alabama and (NTSB), W.D.C.,

Date of transcription

FEDERAL BUREAU OF INVESTIGATION

	$\overline{\cdot}$	
1	On the below date, the below listed Special Agent (SA) met with representing the Suffolk County Medical Examiner's Office (SCMEO), Building 487, North County Complex, Hauppauge, New York, 516-853-5555. SA provided with 3,521 color photographic slides which are the property of the SCMEO which had been obtained by SA on 4/11/97.	67 C
	These slides depict the SCMEO photographs taken of the victims of the crash of TWA flight 800. These slides have been duplicated into photographs by the FBI New York Office (NYO) photo lab. These photographs are being maintained in a secure location and are being utilized in conducting a victim injury analysis. Assisting in this analysis are	67E

These slides were maintained in the custody of SA and the NYO photo lab while in possession of the FBI.

U.S. Army Aeromedical Research Center, Ft. Rucker,
National Transportation Safety Board

265A-NY-259028-SUB — (30)

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FBI FACSIMILE

COVERSHEET

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	☐ Sensitive	(includ	ing covershe	et)
	☑ Unclassified			
	THE ARMED FORCES MEDICA	L EXAMINER	Date:	5/27/97
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racsimile Number:			-	D /
Attn:				
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PATHOLOG	SISTS FROM THE ARMED FOR	RCES		
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_INSTITUT	E OF PATHOLOGY (AFIP)		_	
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U.S. Department of Justice



Federal Bureau of Investigation

In Reply, Please Refer to File No.

26 Federal Plaza New York, New York 10278 May 27, 1997

Office of the Armed Forces Medical Examiner Medical Examiner

67C

1413 Research Boulevard Rockville, Maryland 20850

Re: National Transportation Safety Board (NTSB) letter dated May 23, 1997, to the Office of

the Armed Forces Medical Examiner

Dear

17L

In furtherance of an ongoing investigation being conducted by the Federal Bureau of Investigation (FBI) in conjunction with the NTSB into the matter of Transworld Airlines (TWA) Flight 800, the FBI will incur all expenses (i.e. travel, lodging, etc.) for the services of two (2) pathologists from the Armed Forces Institute of Pathology (AFIP) which have been requested by the senior medical consultant to the FBI and NTSB on this matter.

The FBI recognizes that AFIP pathologists' services will be required for a period of two to three weeks during the months of June and July 1997.

Your cooperation in this matter is appreciated.

Sincerely,

JAMES K. KALLSTROM Assistant Director in Charge

b7C

by:

Supervisory Special Agent

4-13-00 SPS topun

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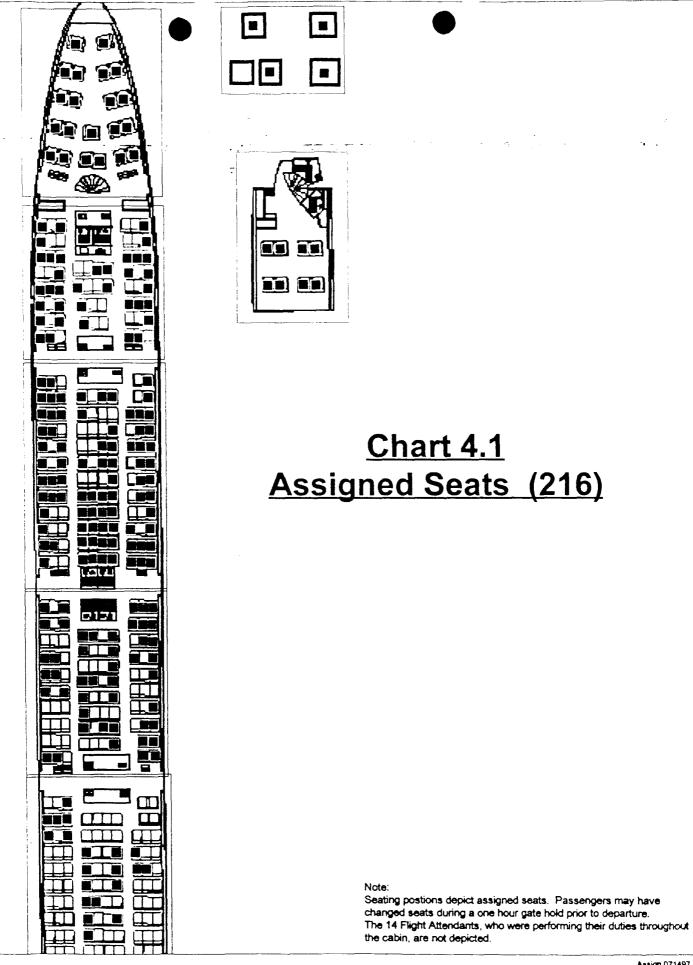
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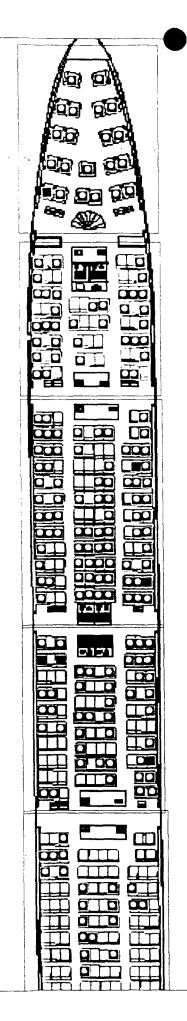
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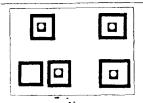
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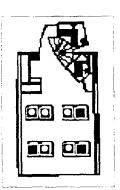
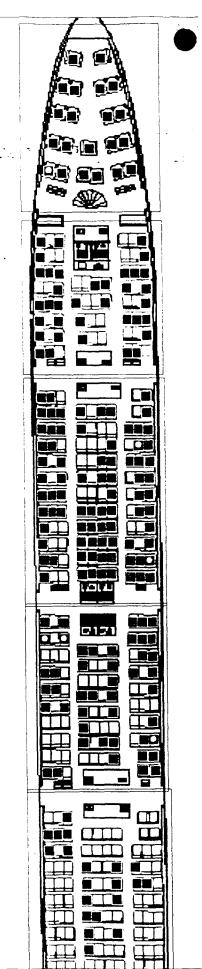
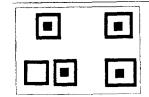


Chart 4.2 Assigned Seats with Recovered Victims

- Recovered victims (207)
- Assigned seats (216)

Note:





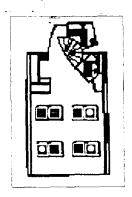
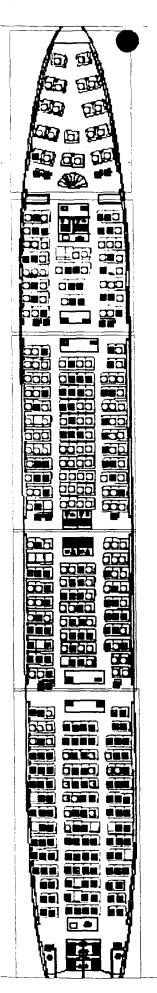
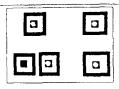


Chart 4.3 Assigned Seats with Unrecovered Victims

- O Unrecovered victims (9)
- Assigned seats (216)

Note:





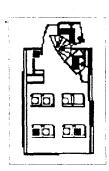
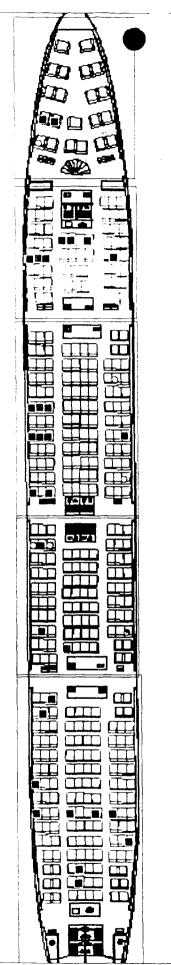
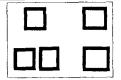


Chart 4.4 Seats and Victims Recovered

- Recovered victims (207)
- Recovered seats (420)

Note:





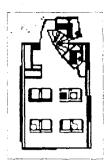
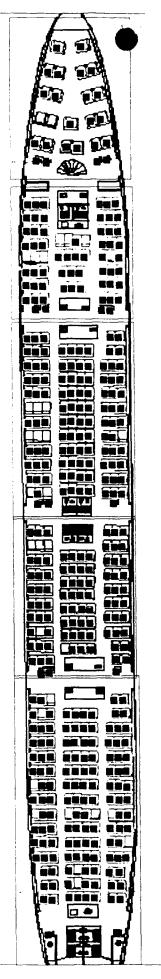


Chart 4.5 Seats and Victims Not Recovered

- Quantum Victims not recovered (9)
- Seats not recovered (35)

Note:



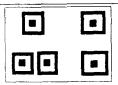




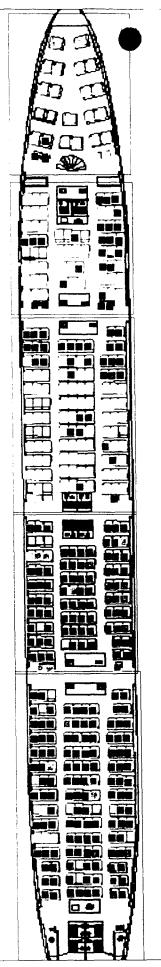
Chart 4.6 Recovered Seats and Fire Damaged Seats

- Fire Damaged Seats (66)
- Recovered seats (420)

Note:

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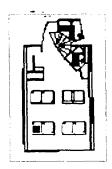


Chart 4.8 Seat Damage

- Minimal (17)
- Moderate (33)
- Severe (28)
- □ Destroyed (157)
- Fragmented (185)

Note:

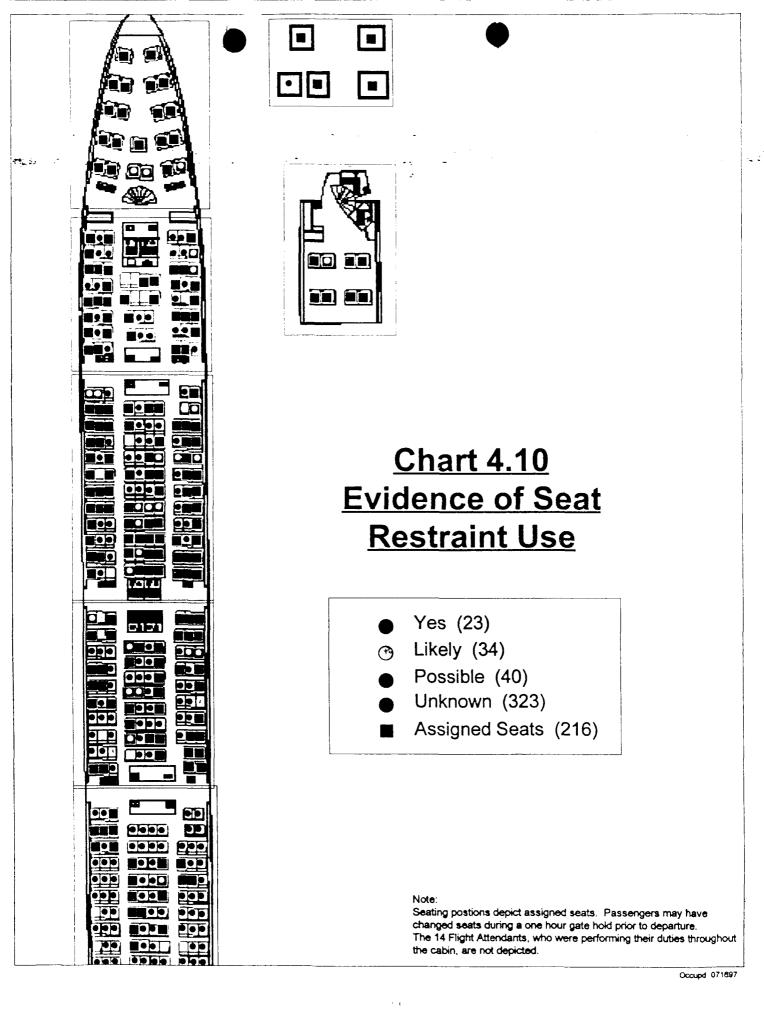
Seating postions depict assigned seats. Passengers may have changed seats during a one hour gate hold prior to departure. The 14 Flight Attendants, who were performing their duties throughout the cabin, are not depicted.

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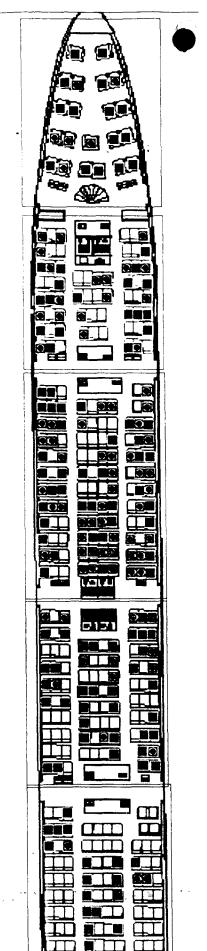
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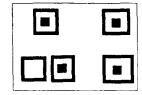


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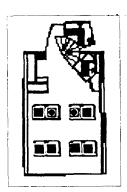
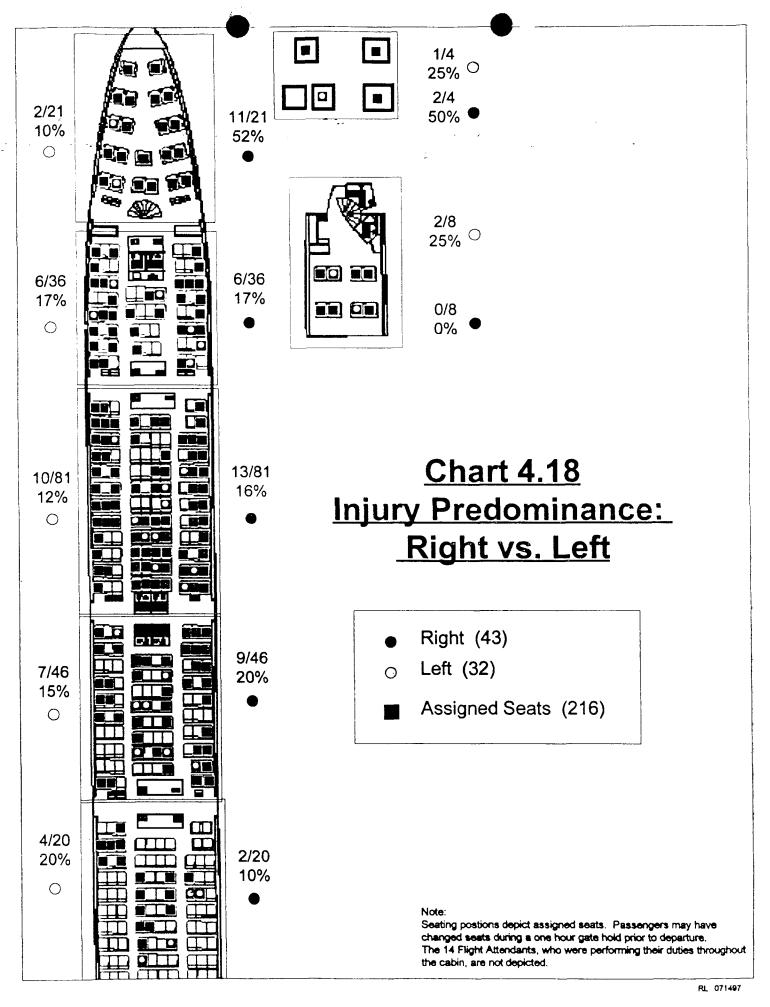


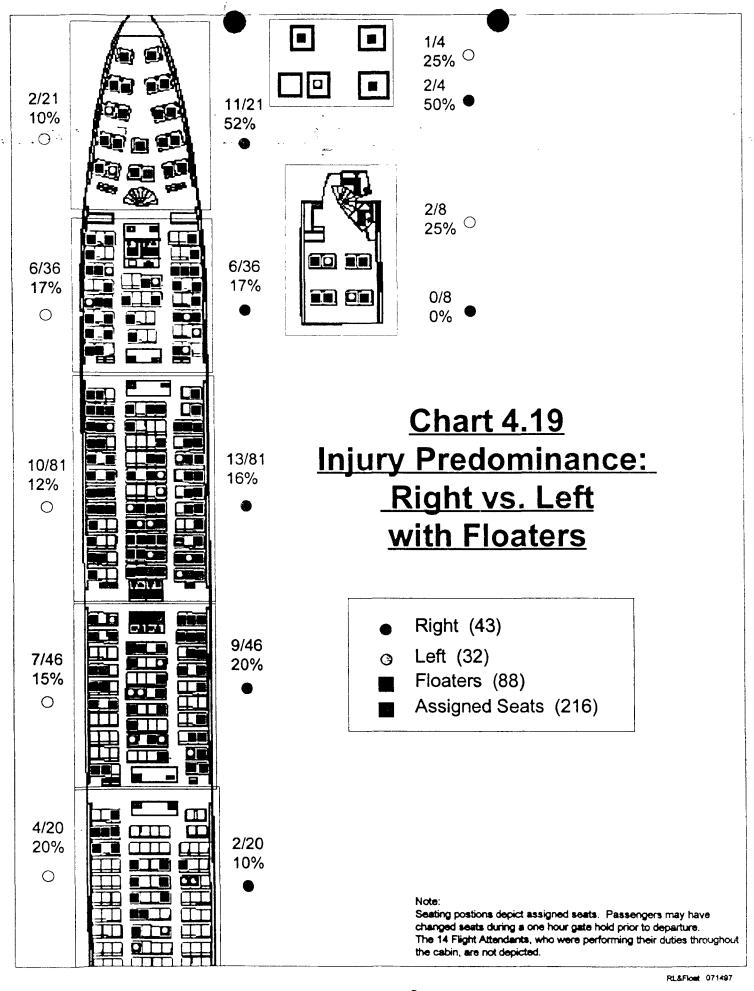
Chart 4.12 Floaters/Assigned Seats

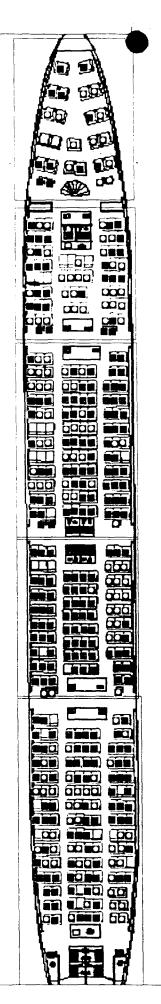
- Floaters (88)
- Assigned Seats (216)

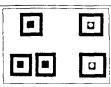
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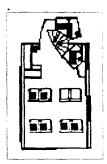
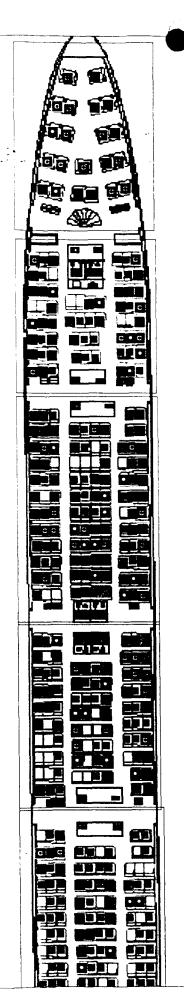


Chart 4.20 Seat Deformation: Right vs. Left

- Right Force Vector (191)
- ⊕ Left Force Vector (151)
- Recovered seats (422)

Note:



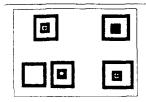


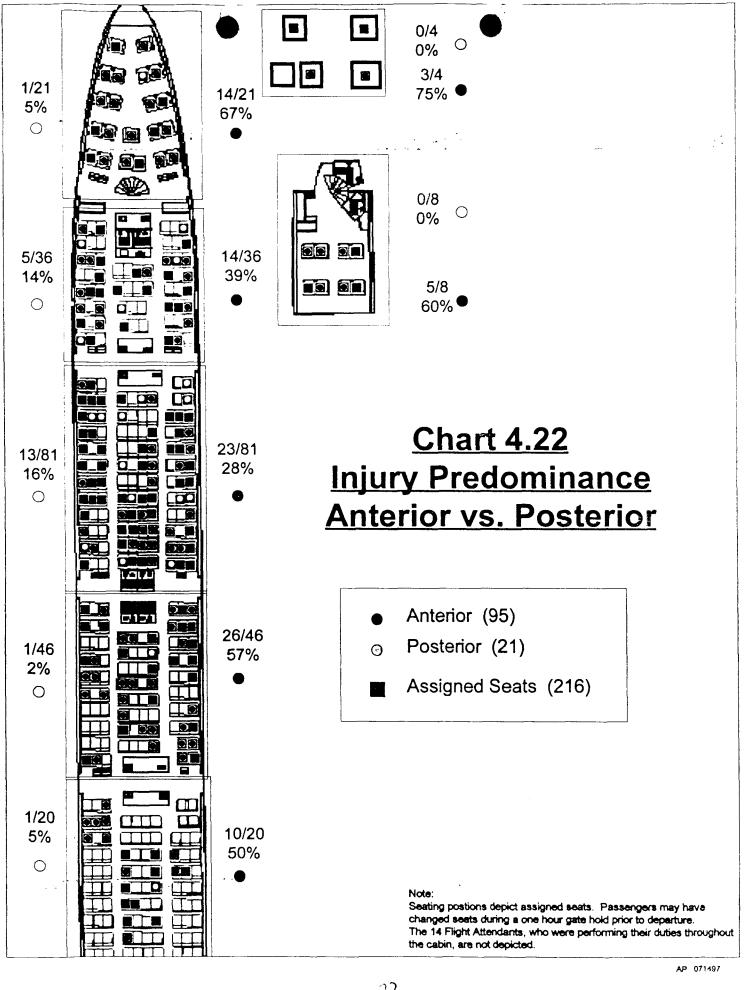


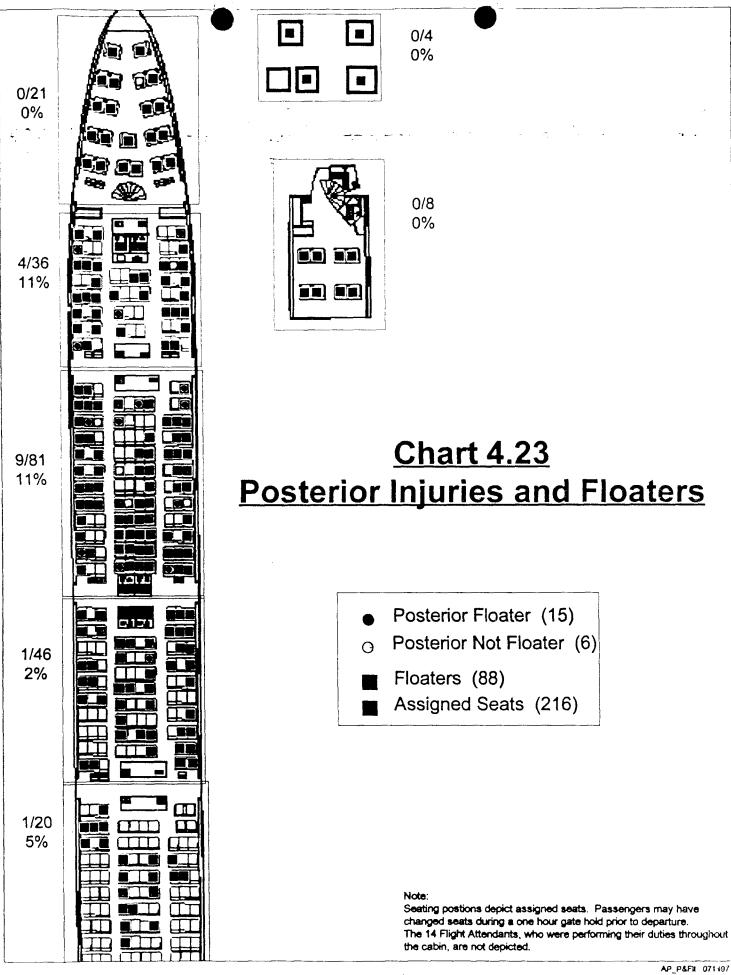
Chart 4.21 Right vs. Left Injury Predominance and Seat Deformation

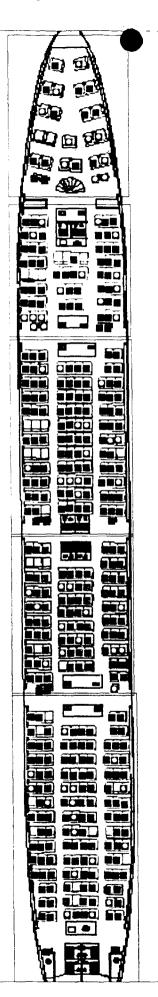
- Right Injury (43)
- Right Force Vector (191)
- Left Force Vector (151)
- Assigned Seats (216)

Seat deformation was determined by visual observation. The orientation of the examination was facing forward and defermation was indicated by the direction in which a given component(s) were bent.

Note:







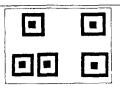


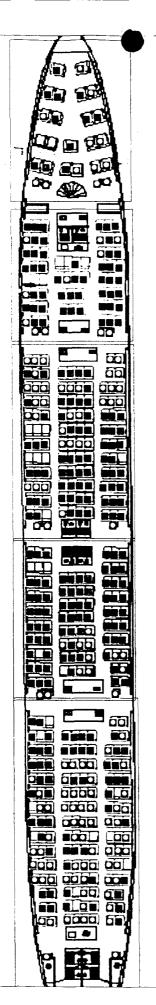


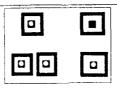
Chart 4.24 Seat Deformation: Fore vs. Aft

- Fore Force Vector (250)
- O Aft Force Vector (72)
- Recovered seats (422)

Seat deformation was determined by visual observation. The orientation of the examination was facing forward and defermation was indicated by the direction in which a given component(s) were bent.

Note





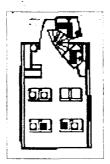


Chart 4.25 Seat Deformation: Up vs. Down

- Up Force Vector (164)
- O Down Force Vector (157)
- Recovered seats (422)

Seat deformation was determined by visual observation. The orientation of the examination was facing forward and deformation was indicated by the direction in which a given component(s) were bent.

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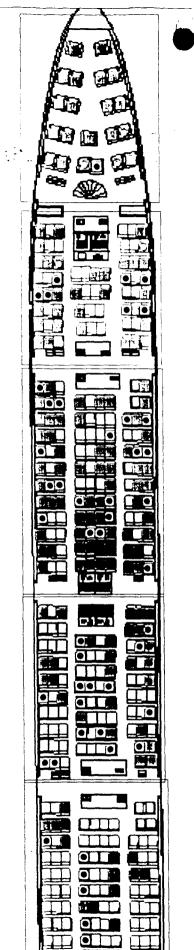
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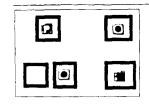
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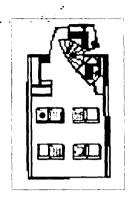


Chart 4.29 Area of Recovery and Recovered Victims

Area of Recovery

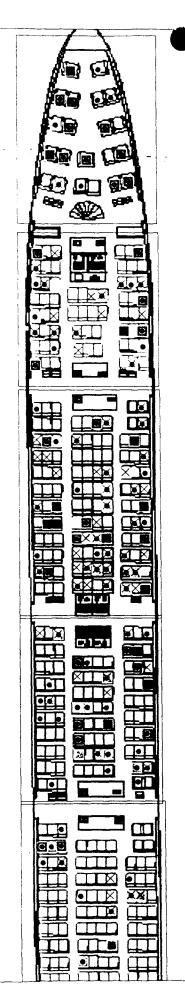
- 3 (36)
- e 2 (7)
- 1 (16)
- Recovered victims (207)

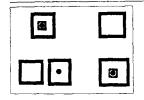
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265A-NY-259028- SUB FF3 108 pages 31 and 32

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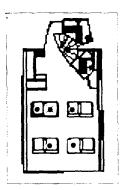


Chart 4.c Floaters with Injury Predominance: Anterior vs. Posterior, Right vs. Left

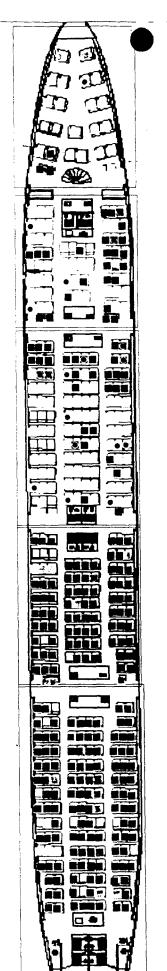
- Anterior (95)
- Posterior (21)
- Right (43)
- ☐ Left (32)
- x Floaters (88)

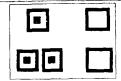
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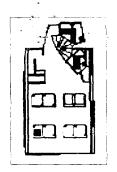


Chart 4.f Posterior Injury and Seat Damage

- Minimal (17)
- Moderate (33)
- Severe (28)
- Destroyed (157)
- Fragmented (185)
- Posterior Injuries (21)

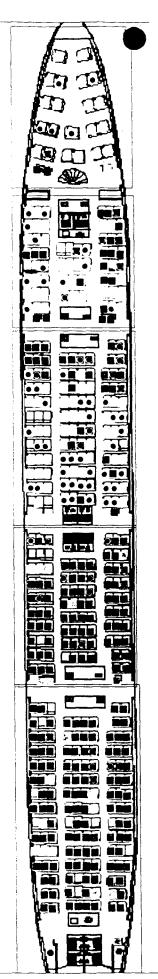
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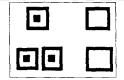
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265A - NY - 259028 - SUB FF3 108 page 37

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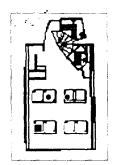


Chart 4.h Floater and Seat Damage

- Minimal (17)
- Moderate (33)
- Severe (28)
- ☐ Destroyed (157)
- Fragmented (185)
- Floater (88)

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EDERAL BUREAU OF INVENIGATION

Precedence: ROUTINE Date: 07/29/1996

To: NEW YORK

Attn: SAC, DIVISION I

From: NEW YORK

I-46, DIVISION

Contact: "SA"

L7C

Approved By:

Drafted By:

cm

File Number(s): 265A-NY-259028 (Pending)

Title: UNSUB(S); EXPLOSION OF TWA FLIGHT 800 ON 7/17/96;

AOT-IT; EID; OO:NY

Synopsis: SUB-FILE ADMINISTRATION

Details: In addition to the main file, the following is a

listing of sub files for captioned matter:

SUB A. Outgoing communications.

SUB B. Incoming communications.

SUB C. Administrative Matters.

SUB D. Lead Sheets - Copies of all lead sheets.

D1. 800 Generated Leads

D2. Internet Generated Leads

D3. Miscellaneous Lead - No action to be taken.

SUB E. Secret - To maintain classified information.

SUB F. Press releases and news clippings.

SUB G. Searches

G1. Moriches recovery - reclass to FF. G2. Articles received from JFK Airport.

SUB H. Claims of responsibilities.

SUB I. Logs - copies of Daily Activity Log.

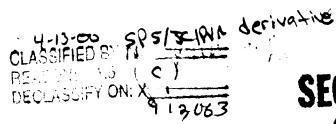
SUB J. Top Secret - maintained in I-46 safe.

265A-NY-259028-SUB

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1996

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To: NEW YORK From: NEW YORK Re: 265A-NY-259028, 07/29/1996

Investigative reports of outside Agencies/Police SUB K.

Departments.

SUB FD302 The original and one copy of FD302's.

SUB INS The original and one copy of inserts.

SUB BC Background checks.

Draft requests and financial related SUB CE

documents.

SUB LAB Lab reports.

Copies of subpoenas issued. SUB SPB

SUB TEL Telephone subscriber and toll information.

SUB AA. Flight Related investigative matters.

Flight 800 passenger manifest.

AA2. Interviews

Flight 800 cargo manifest. AA3.

Flight 881 passenger manifest.

Flight 881 cargo manifest. AA5.

Maintainance Flight 800. AA6.

Previous bomb threats and related matters. SUB BB.

Possible missile attack. SUB CC.

CC1. Interviews - Land Canvass

CC2. Interviews - Technical Data
CC3. Interviews - Vessels and Aircraft

CC4. Interviews - Marinas

CC5. Stolen Crafts

CC6. Police Canvass - Unusuals

Airport Related/Port Authority SUB DD.

> Information DD1.

DD2. Pay Telephone Dumps

DD3. Stolen/Abandoned vehicles at airports

Manifest of International Flights. SUB EE.

SUB FF. Recovery effort - Moriches/Grumman

FF1. Copies of Outgoing Leads/Lab Request

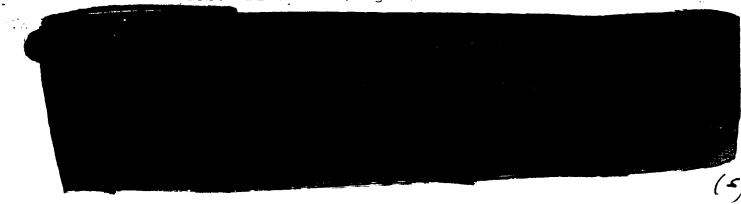
Lab reports FF2.

Medical Examiner Reports

To: NEW YORK From: NEW YORK Re: 265A-NY-259028, 07/29/1996

FF4. Temporary Morgue Reports

FF5. Dive Sheet/Logs

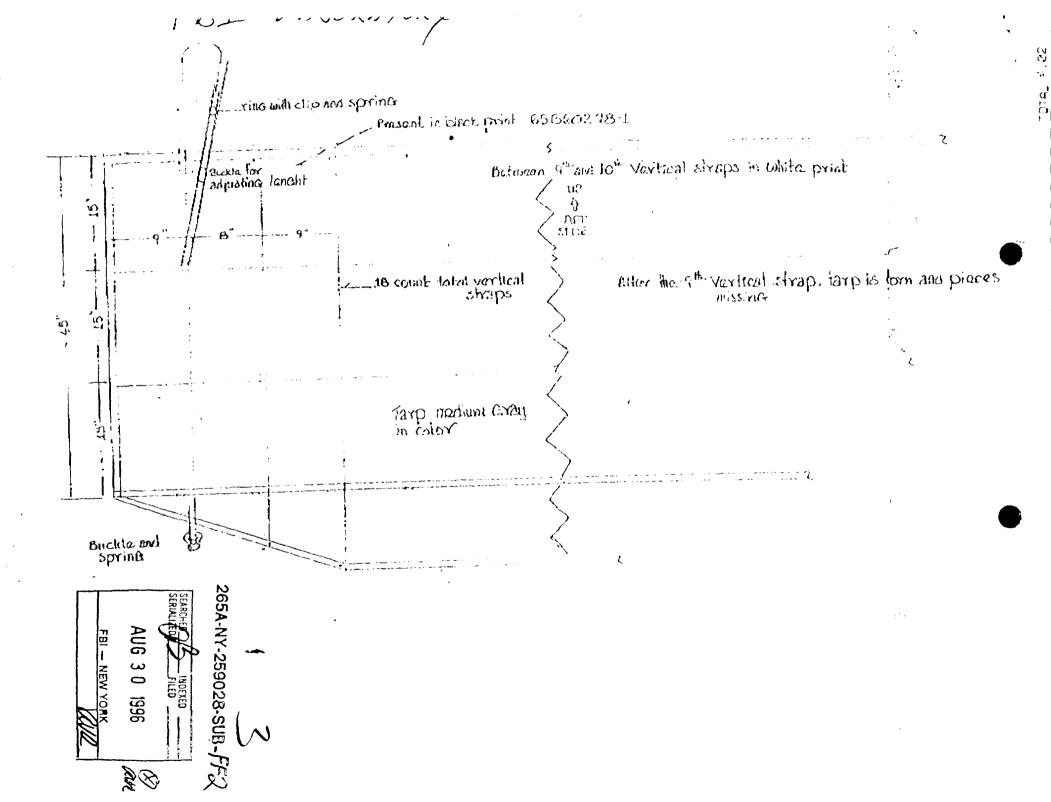


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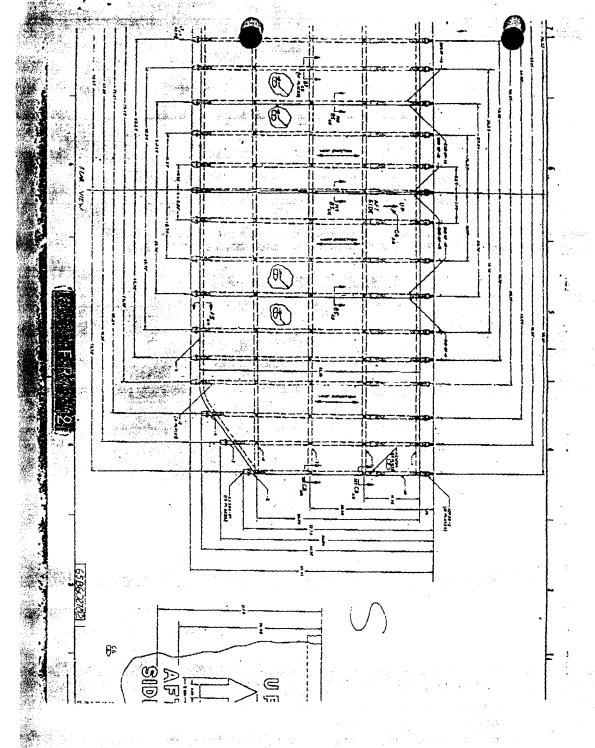


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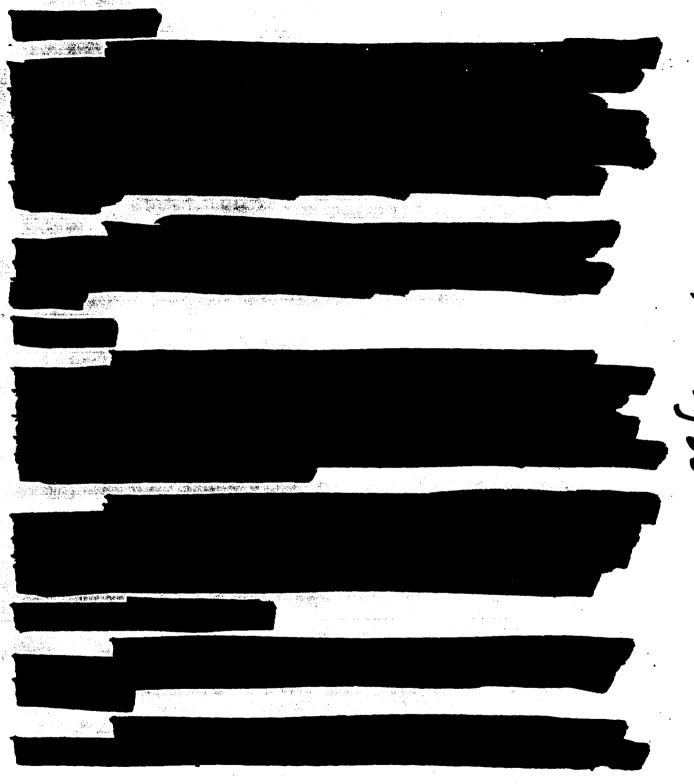
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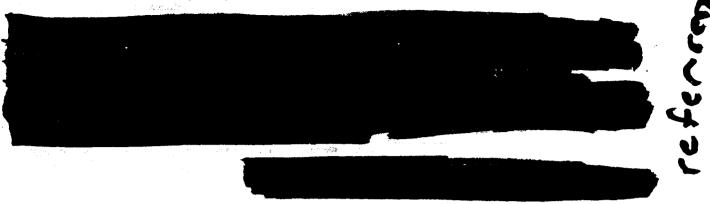
(06/01/1995)

To: NEW YORK From: NEW YORK
Re: 265A-NY-259028, 08/10/1996



(06/01/1995)

To: NEW YORK From: NEW YORK
Re: 265A-NY-259028, 08/10/1996



RAL BUREAU OF INVEST

Precedence: IMMEDIATE Date:

01/21/97

LABORATORY DIVISION - ...

Attn: SECTION CHIEF RANDALL

MURCH/SSA

From:

CALVERTON CP

Contact: \$516-369-3313

Approved By:

Drafted By:

Case ID #: 265A-NY-259028-FF (Pending)

Title: UNSUB;

EXPLOSION OF TWA 800;

7/17/96 AOT-IT-EOD; OO: NEW YORK

Synopsis: Notification of meeting at Boeing Corporation, Everett, Washington, to review status of Boeing overpressure analysis of B-747 center wing tank

Details: On Thursday, February 6, 1997, the Boeing Corporation will hold a meeting to review the status of Boeing overpressure analysis of the B-747 center wing tank. The meeting agenda is as follows:

> 8:00-10:00 Factory Visual (optional - limited number of people can be accommodated)

Official Meeting Start 10:00

Overpressure Analysis

Introduction/Background 1/2-1 hrFuel/Air Explosion Physics 1 hr Multi-Cell Compartments (Varied 1/2-1 hrIgnition locations)

Structural Analysis Status 1 hr

1-ADIC KALLSTROM

1-SAC O'NEILL

1-ASAC DOMROE

1-SSA

1-SSA

To: ADIC, NEW YORK From: SA

Re: 265A-NY-259028, 08/06/1996

SA will attend as a representative from a Bureau Aircraft Accident Investigator, is New York. one of two agents working in a liaison capacity with the National Transportation Safety Board (NTSB) and all of the parties participating in the investigation into the cause of the explosion and crash of TWA 800 on July 17, 1996. SA travel from the Phoenix Division to attend the above described meeting departing Phoenix late February 5 and returning on the evening of February 6, 1997.

It is requested that a representative from the FBI Laboratory attend the above meeting consistent with previous meetings concerning testing conducted to determine cause of the explosion and crash of TWA 800 July 17, 1997.

It is anticipated that the Boeing Corporation will furnish transportation to the meeting site in Everett, Washington from a hotel location near the Seattle-Tacoma International Airport. This information will be provided when it is obtained.



FEDERAL BUREAU OF INVESTIGATION WASHINGTON, D. C. 20535

Date: April 25, 1997

ADIC, New York.

265A-NY-259028 FBI File No.

Lab No. 61114052 S AD HK

70207064 S AD HK 70224039 S AD HK

Your communications dated February 6 and 19, 1997 Reference:

Your No.

265A-NY-259028

UNSUBS; Re:

EXPLOSION OF TWA FLIGHT 800;

AOT-IT-EOD

Specimens received:

February 7 and 24, 1997

Specimens received February 7, 1997 under cover of communication dated February 6, 1997 (70207064 S AD HK):

One piece of splatter material (your item #MM1 CW-504 Q128

LBL-104)

One piece of splatter material (your item #MM3 CW-504 Q129

LBL-106.72)

One piece of splatter material (your item #MM4 Q130

LBL-106)

One piece of splatter material (your item #MM5 CW-Q131

114)

One blade NE8

Page 1

كاهانعبهم Fax do SSA

265A-NY-259028-5UB FF 2 SEARCHLD SERIALIZED. $_{\rm min} = 5 1991$

INFORMATION CONTAINED UNGLASSIFIED EXCEPT

This Report Is Furnished For Official Use OnlyWHERE SHOWN OTHERWISE.

Specimens received February 24, 1997 under cover of communication dated February 19, 1997 (70224039 S AD HK):

. : к з	One sample of fiberglass like material taken from floor board (your item #57-1)
K4	One sample of foam like material taken from floor board (your item #57-2)
K5	One sample of fiberglass like material taken from air duct (your item #59-1)
K6	One sample of foam like material taken from air duct (your item #59-2)
K7	One sample of fiberglass like material taken from air duct (your item #61-1)
К8	One sample of foam like material taken from air duct (your item #61-2)

Results of Examination:

GENERAL INFORMATION:

This report provides the results of examinations conducted in the Chemistry Unit on specimens Q110 - Q116, Q128 - Q131, K3 - K8.

For a complete listing of specimens and the results of previous examinations please refer to previous report dated 3/26/97 (Lab. #60723031 S AD AR, 60730006 S AD RU, 60730007 S AD RU, 60806002 S AD ZG, 60909001 S AD AR RU, 61118011 S AD HJ, 61127057 S AD HK, 60727032 S AD AR, 60728031 S AD AR, 60804032 S AD AR, 60817031 S AD AR,60818061 S AD AR, 60830005 S AD AR, 60912038 S AD AR, 61007055 S AD AR).

Examinations are continuing on Q25 - Q81 and Q109 in the Special Photography Unit. You will be advised of the results of these examinations in a separate report.

Page 2 61114052 S AD

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SECRET

CHEMICAL ANALYSES:

Specimens Q110 - Q116 were examined microscopically.

Red material and amber material from specimen Q110 and red material from specimen Q111 were further examined instrumentally, including Fourier Transform Infrared Spectroscopy, Pyrolysis-Gas Chromatography/Mass Spectrometry, and Scanning Electron Microscopy

[3] The materials from Q110 and Q111 are consistent with a chlorinated, polymeric material, commonly used as a contact adhesive. Based upon the comparison examinations conducted, with noted differences, specimens Q110 - Q116 are consistent with a common origin.

Specimens Q128 - Q131 (FBI Laboratory #70207064) and specimens K3 - K8 (FBI Laboratory #70224039) were examined microscopically. Specimens Q128 - Q131 and specimens K6 and K8 were further examined instrumentally with Pyrolysis-Gas Chromatography/Mass Spectrometry and Fourier Transform Infrared Spectroscopy. Based upon the comparison examinations conducted, specimens Q128 - Q131 are consistent with having originated from the sources represented by K6 and K8, or a similar source.

Specimens K3, K5, K6 and K7 (70224039) ostensibly represent construction products that utilize fiber glass fabrics. These fabrics generally consist of woven and non-woven bundles of continuous-filament glass fibers. Specimens Q128 - Q131 (70207064) also contain continuous-filament glass fibers, but they cannot be specifically associated with specimens K3, K5, K6 and K7. The small size, limited amounts, and the altered and adulterated nature of specimens Q128 - Q131 preclude any further comparison.

DISPOSITION OF SPECIMENS:

The submitted specimens referenced in the above analyses will be returned to your office under separate cover via registered mail or equivalent.

Page 3 8 AD 61114052 S AD

SECRET

FEDERAL BUREAU OF INVESTIGATION

Precedence: ROUTINE Date: 12/08/1997

To: New York

-- Attn:

ADIC JAMES KALLSTROM SAC JOHN O'NEILL ASAC PASQUALE DAMURO SSA

SA' DET

From: New York

FBI Command Post, Calverton, New York

Approved By:

Drafted By:

Case ID #: 265A-NY-259028 (Pending)

Title: UNSUB(S);

EXPLOSION OF TWA 800;

7/17/96 AOT-IT-EOD; 00: NEW YORK

Synopsis: Incorporates the 185 items of 1B evidence submitted for laboratory analysis in the investigation of TWA Flight 800 into the case file.

Enclosures: Enclosed are folders documenting the identification, movement and analytical results of 185 items of 1B evidence submitted for laboratory analysis.

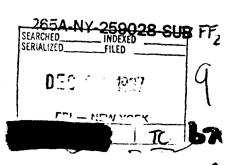
Details: A total of 185 items (items #1-#185) of 1B evidence were submitted for metallurgical and chemical analysis during the course of the investigation. The 1B numbers assigned to the 185 items of evidence submitted for analysis range from 1B9, the first item of evidence, through 1B 586 for items 184 and 185.

The laboratories that examined the 185 items of 1B evidence include FBI, NTSB, Brookhaven, DIA and Boeing.

Each enclosed folder for the 185 items of 1B evidence submitted for laboratory analysis contains photographs, electronic communications documenting the movement of the evidence, laboratory results and the FD-192 (green sheet).

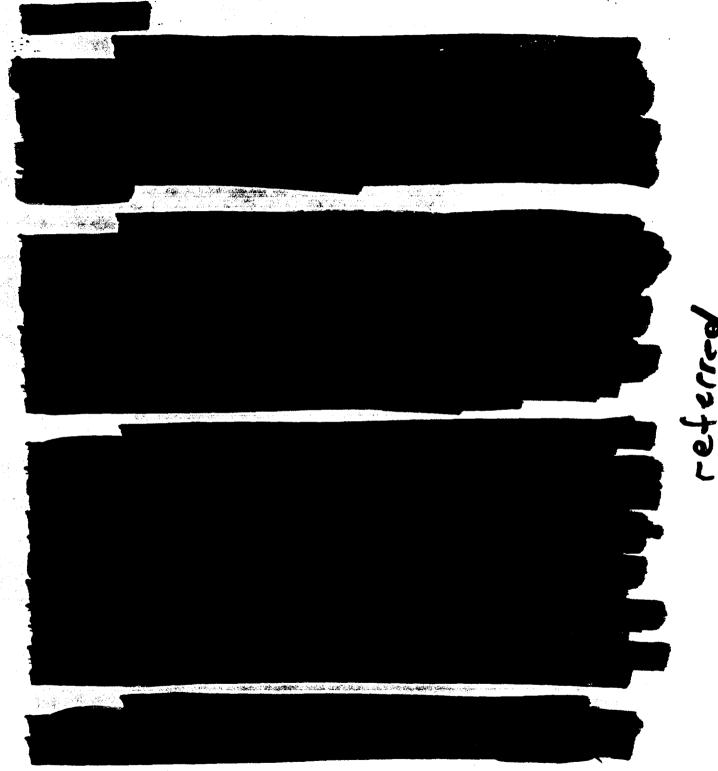
Each folder provides a complete history of each item of evidence and should be made a permanent part of the case file 265A-NY-259028.

> ALL INFORMATION CONTAINED THESTITED -13-00





Re: 265A-NY-259028, 08/10/1996



Deletions were made pursuant trelease to you.	o the exemptions indicated below with	no segregable material available for
Section 552		Section 552a
(b)(1)	□ (b)(7)(A)	□ (d)(5)
□ (b)(2)	□ (b)(7)(B)	□ (j)(2)
□ (b)(3)	□ (b)(7)(C)	□ (k)(1)
	(b)(7)(D)	□ (k)(2)
	(b)(7)(E)	□ (k)(3)
	(b)(7)(F)	□ (k)(4)
□ (b)(4)	(b)(8)	□ (k)(5)
□ (b)(5)	(b)(9)	□ (k)(6)
□ (b)(6)		□ (k)(7)
to the following of this mion	shed by another Government agency(ie mation following our consultation with final release determination has not been	the other agency(ies).
Pages were not considered for r	elease as they are duplicative of	
Page(s) withheld for the followi	ng reason(s):	
	ed for reference regarding these pages:	